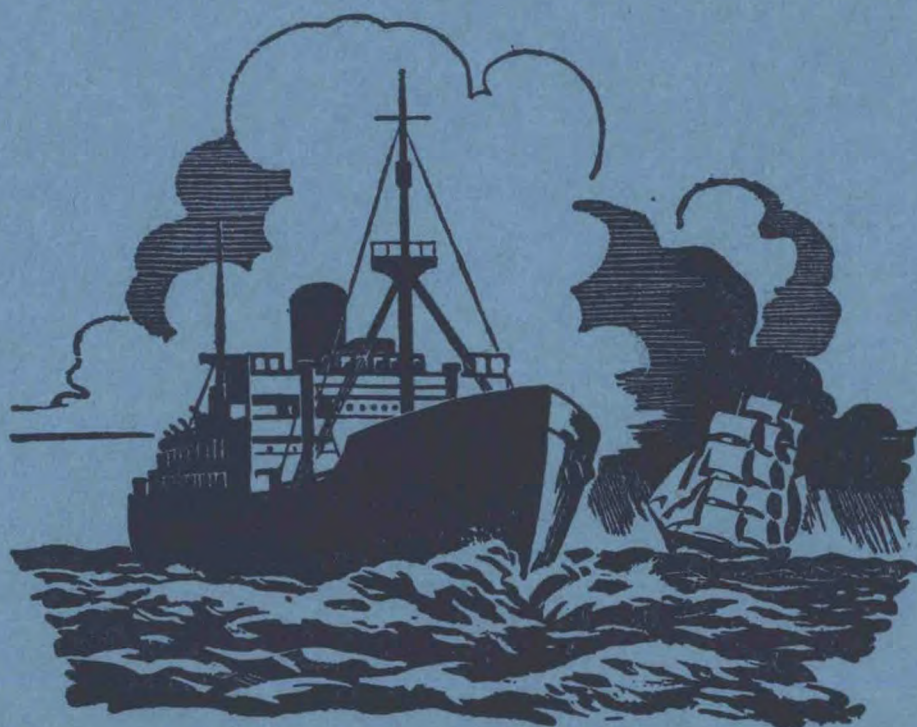


M.O. 749

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



Volume XXXIV No. 204

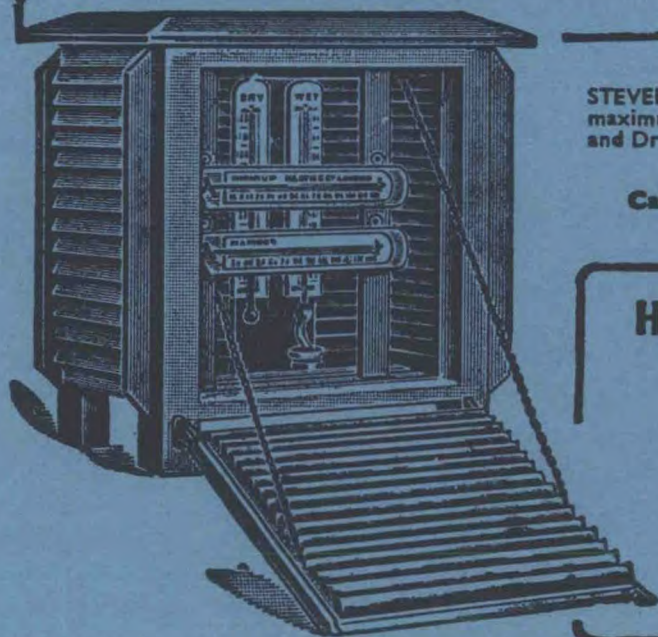
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The Marine Observer's Handbook (8th Edition)

Numerous revisions and additions have been made in this edition to bring the book up to date. In particular, a new series of photographs have been added to Part II, depicting the appearance of the sea corresponding to each of the Beaufort forces; there is also a section of cloud photographs. The Phenomena section has been enlarged and re-arranged and, in anticipation of the change to the Celsius temperature scale, Celsius dewpoint tables have been included.

(M.O.522)

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DIVISION OF THE METEOROLOGICAL OFFICE

VOL. XXXIV	No. 204	APRIL 1964
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*Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer,"
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Editorial

The 3rd Session of the Assembly of the Inter-Governmental Maritime Consultative Organisation (one wonders why they had to choose so ponderous a title) was held at its headquarters in London in October 1963. I.M.C.O., which was only formed in 1959, as a specialised agency of the United Nations, now has a membership of 57 countries, 45 of which were represented at the Assembly. Seven other specialised agencies of United Nations, including the World Meteorological Organisation, the Inter-Governmental Oceanographic Commission (I.O.C.), and the Food and Agriculture Organisation (F.A.O.) which looks after fishery interests, and 8 non-Governmental Organisations closely associated with shipping were represented by observers. The chief task of the Assembly was to deal with the report of the Maritime Safety Committee, which is the technical body of I.M.C.O. The subjects discussed included the International Conference for the Prevention of Pollution of the Sea by Oil (1962); simplification of the existing complicated tonnage measurement rules; questions concerning the sub-division and stability of ships; co-ordination of safety at sea and in the air; the preparation of international rules for the carriage of dangerous goods by sea; special navigational arrangements for the Strait of Dover area (always notorious for collisions); the study of problems concerning fire protection aboard ship; the preparation of a manual of safety practices for fishing vessels; arrangements for an International Conference to revise the existing Loadline Convention; the revision of the existing International Code of Signals; the marking and lighting of oceanographic buoys for identification and anti-collision purposes; merchant ship reporting systems; and communication problems concerning the dissemination of ships radio weather messages. This formidable list shows that the activities of I.M.C.O., whose main function is to promote safety and efficiency at sea, are very varied. Many of these questions have a direct meteorological aspect—for safety at sea is inevitably related to weather conditions—hence the reason why the W.M.O. is usually represented at meetings of the Maritime Safety Committee and the Assembly of I.M.C.O.

In April 1963 the Congress of the World Meteorological Organisation held its 4th Session at Geneva. 102 member countries and 25 other International Organisations (including I.M.C.O.) were represented at this Session and this large attendance seems to be evidence of the universal interest of governments as well as individuals in meteorology. Obviously the agenda included many items of a very specialised scientific nature, but as they all have the aim of adding to meteorological knowledge they have an indirect if not a direct interest to seamen. Questions of direct maritime interest included plans for the improvement of meteorological networks, involving, *inter alia*, the establishment in oceanic areas where shipping is sparse, of more ocean weather ship stations and automatic buoys (in consultation with the I.O.C.) and of island stations; improved telecommunication systems, especially in the Southern Hemisphere; arrangements for the preparation of marine climatology summaries; and arrangements for W.M.O. to take an active part in the planning of and participation in oceanographic projects. Other subjects included the establishment of a standing committee for studying Antarctic meteorology; questions concerning the most effective use of meteorological data received from artificial earth satellites; meteorological research, particularly in tropical areas on a national and international level; the application of meteorology to hydrology and water resource development; participation in technical assistance projects; and the meteorological programme of the International Years of the Quiet Sun (I.Q.S.Y.) (1964–65, when sun-spot activity is at a minimum).

Probably the most important item from the mariner's viewpoint is the project to improve the meteorological network in oceanic areas where shipping is relatively sparse, not only because this may pave the way to better forecast services for such areas, but also because it will lead to a better understanding of world weather

generally. In the W.M.O., all technical questions are referred to its technical commissions and this one is under active consideration by the Commission for Maritime Meteorology.

One item which seems to need explanation is the I.Q.S.Y. programme. Whereas the meteorological programme of the International Geophysical Year (I.G.Y.) was to learn more about the large scale physical, dynamic and thermodynamic processes of the general circulation of the atmosphere *below* the 100 mb. (about 55,000 ft.) level, the I.Q.S.Y. will be devoted to similar (and more difficult and specialised) studies of the atmosphere above that level—and the relationship between the upper and lower atmosphere. Voluntary observers at sea, who made a very useful contribution to the I.G.Y. programme by providing an enormous number of surface observations, will not therefore be called upon to participate in the programme of I.S.Q.Y., except for reporting all auroræ observed.

When one considers the humanitarian and economic importance of safety at sea it seems rather surprising that I.M.C.O. wasn't formed earlier. Perhaps one reason was that merchant shipping was so world-wide in character and went back so far in history that international co-operation was already present on a more or less informal basis and therefore no permanent inter-governmental body was considered really necessary earlier. The customs of the sea are almost universal; seamen more or less speak the same language and commercial practice, marine insurance and maritime law are all basically international as they have been since very early times, and they need to be. Essential legislation such as the Regulations for preventing collisions at sea, the International Convention for Safety of Life at Sea, Loadline Rules and the Tonnage Measurement Rules have been agreed at isolated International Conferences—most of the Conventions being the administrative responsibility of the United Kingdom. The need for a permanent International Organisation for shipping was probably not unrelated to the fact that so many more countries nowadays own merchant shipping fleets than previously. Since its formation, I.M.C.O. seems to have done a very useful job.

It seems more surprising that it was not until October 1960 that the Inter-Governmental Oceanographic Commission was born. Oceanography, like meteorology, needs international co-operation if it is to make any progress, but to a somewhat lesser extent. The atmosphere has no frontiers whereas the oceans have their bounds at the edge of territorial waters. Maury recognised the need for international co-operation in oceanography as well as meteorology when his ideas inspired the first international meteorological conference at Brussels in 1853. The observations which this conference agreed should be made voluntarily aboard merchant ships included sea temperature at the surface and at "any depth that may to the observer seem good"; deep sea soundings, using the deep sea lead line; specific gravity of the water; surface currents; observations of the colour of the water; sea ice; observations of fish, seaweed and drift wood; and, when the ship was at anchor, tidal observations. Maury himself in his *Sailing Directions* produced in 1855 discusses whale populations and ocean depth as well as surface currents and marine meteorology. Officers aboard merchant ships still continue to do this voluntary oceanographic work, thus providing the information from which ocean current atlases have been prepared, for example, and most of their other observations have eventually been made use of, in one way or another, by professional oceanographers. All this has been done under the guidance of the Meteorological Office—in harmonious consultation with the Admiralty and the other oceanographic institutions concerned. Whereas the meteorologists followed up the Brussels meeting with the creation in 1873, of the International Meteorological Organisation (parent of the W.M.O.) the oceanographers preferred to proceed more slowly, although they did co-operate internationally as and when the occasion arose, either directly or through such organisations as the International Council for the Exploration of the Sea. During recent years, however, the world has become suddenly more aware of the economic and military implication of oceanographic research and in view of the enormous

expense of oceanographic work has realised that official international co-operation is essential. The present International Indian Ocean Expedition, which is a joint oceanographical and meteorological project, is a good example of what can be done by combined effort. The I.O.C. and W.M.O., if they play their cards right, may pave the way to a joint oceanographical/meteorological ocean station vessel project in the Southern Hemisphere, on an international basis, for the eventual benefit of the whole world. Such a scheme might for example involve chartered merchant ships, operating about 1500 miles from base in the areas where shipping is very unfrequent, making meteorological and oceanographical observations and sending them by radio. Such ships would not need to carry out all the functions of the North Atlantic ocean station vessels, because they wouldn't need to provide facilities for aircraft, so they might be more economical to operate—but they would concentrate on observational work.

All these technical and scientific international organisations have one thing in common, particularly at the level of their permanent technical commissions and committees; politics scarcely ever enter into their discussion. The individual members represent various countries and are mostly experts in their subject; they honestly strive to get the best technical, scientific or social results for the benefit of all concerned subject to reasonable national considerations and they get very good assistance from the permanent secretariat staff of the organisations concerned. And as they correspond and meet fairly frequently they get to know each other quite well and to appreciate each other's point of view, which is, after all, the best way of doing business of any kind.

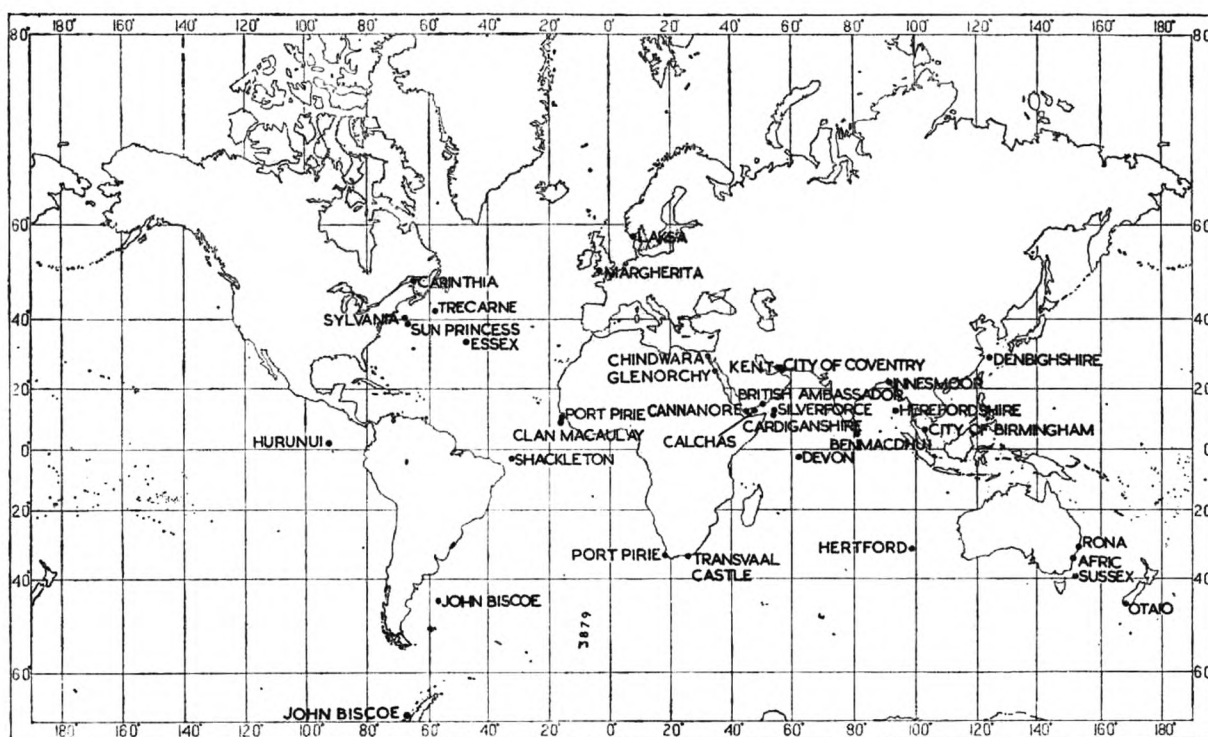
C. E. N. F.



April, May, June

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor.

It sometimes happens that we are unable to offer an explanation for phenomena reported. In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.



Positions of ships whose reports appear in "The Marine Observers' Log".

TROPICAL CYCLONE

Port of Chittagong

m.v. *Innesmoor*. Captain F. Bradfield. Berthed at Chittagong. Observer, Mr. J. C. Priest, 2nd Officer.

27th May 1963. At 0400 GMT, warning of the approach of a cyclone 400 miles sw of Chittagong, which was moving NE, was received from the shore meteorological office. The weather for the previous two days had been very hot with still air, the night temperature remaining at about 80°F. There was still no indication of a break in the monsoon.

28th May

GMT

- 0900 Wind increasing. Now SE, force 7. Torrential rain for 15–20 min. then sky cleared. From this time onwards, all work in the port ceased.
- 1200 Wind freshening again with increasing cloud.
- 1500 Wind SE, force 6. Showers of rain in past hour.
- 1800 Wind now NE, force 9, accompanied by torrential rain. Barograph falling rapidly. Hourly meteorological reports being sent. Tide was high at this time and spray began to blow over the deck. A number of small boats were adrift in the river and tugs steaming into wind.
- 1900 Wind E'N, force 12. Torrential rain.
- 2000 Wind SE, in excess of force 12. Torrential rain, reducing visibility to about 220 yd.
- 2100 Wind s'w, estimated at about 90 kt. Torrential rain. Visibility only about 50 yd. Weather station at Chittagong reported out of action: transmitted our own reports to OBS. CQ. Heavy seas covering decks, and spray rising to 30–50 ft. Extensive damage to buildings. Whole port in darkness due to power failure. Vessel straining to all available moorings; damage to quay extensive. Slight rise in barograph now noted.
- 2200 Wind sw'w, estimated at 85 kt. Torrential rain with 220 yd. visibility.
- 2300 Wind sw'w, force 12. Rain moderate continuous. Visibility improving to 2,200 yd.

29th May

- 0000 Wind sw'w, force 9, very squally. Continuous heavy rain. Visibility now $2\frac{1}{2}$ miles. Barometer began to rise quickly.
- 0300 Wind wsw, force 6. Slight drizzle. Visibility over 5 miles. No further observations made as weather returning to normal for the time of year.

Note 1. This observation was forwarded to the Pakistan Meteorological Service.

Note 2. The tropical cyclone season in the Bay of Bengal normally has two distinct periods coinciding roughly with the change of the monsoon, i.e. April to June and September to December. Most of the worst cyclones in the past have occurred in the later period and the severity of this particular cyclone in late May was somewhat surprising.

Its existence was first detected on 26th May near 11°N , 90°E , moving steadily northward with gale force winds extending out several hundred miles from the centre. Three days later it reached the coast in the vicinity of Cox's Bazaar, about 90 miles south of Chittagong. This town was reported to be completely in ruins.

The bottom topography of this region is favourable to high surges in tropical storm conditions which are themselves intensified near the hot and muggy delta region at the head of the Bay of Bengal. The tidal wave associated with this storm swept inland about 8 miles along the coast, razing every village in its path. The death roll was estimated at about 10,000 with more than a quarter of a million people rendered homeless; on 2nd June a Karachi newspaper reported that fishing nets were being spread over the river near Chittagong to haul in the bodies of men and cattle and pile them in river craft.

Winds at Chittagong were estimated at 130 kt. and together with high storm surges and torrential rainfall wrought tremendous damage in the area. Four ocean-going vessels were driven aground during the storm, three cranes toppled into the water and two jetties were badly damaged. Numerous harbour craft were sunk but on 1st June it was reported that no lives had been lost in the port area. Telecommunications with outlying areas were out of action until 2nd June.

Worse disasters than that of May 1963 have happened to this area in the past. On 7th October 1737 giant storm surges, said to reach as high as 40 feet, near the mouth of the Hooghly river drowned an estimated 300,000 people. Another similar catastrophe took place in 1864 when the death roll was said to be 50,000. In November 1876 a severe cyclone crossed the coast near the mouth of the Meghna River and the associated storm wave drowned some 100,000 people with an additional 100,000 or more lives lost from subsequent famine and disease. More recently, in October 1960 the East Pakistan coast was ravaged by two cyclones within three weeks; these two storms together accounted for 14,000 people killed in the Chittagong area and about 1,000,000 rendered homeless.

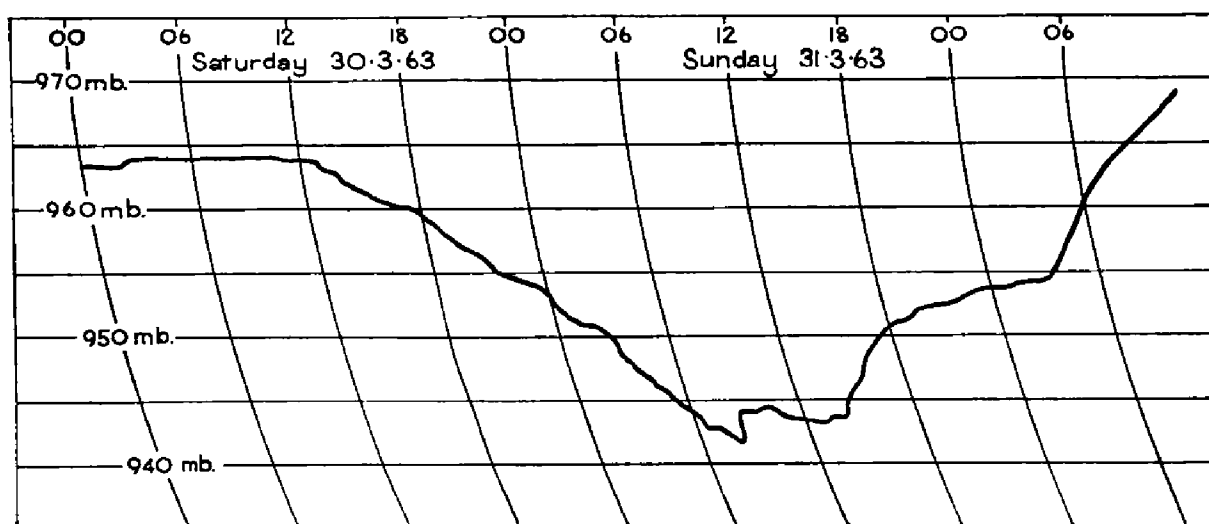
HEAVY WEATHER

Southern Ocean

R.R.S. *John Biscoe*. Captain W. Johnston. Grahamland (Adelaide Island) to Argentine Islands. Observers, Mr. T. Woodfield, Chief Officer, Mr. M. J. Cole, 2nd Officer and Mr. R. N. Cumbers, 3rd Officer.

30th March 1963. At 1230 SMT (1530 GMT) vessel departed from South Adelaide Island. The following account of the subsequent passage to the Argentine Islands has been extracted from the Meteorological Logbook.

- 1315 Barometer commenced to fall. Wind speed increased from force 2-4, veering from W to NE. Air temp. rising from overnight low of 9°F to 24°F . 9°F is lowest temperature recorded on ship during 1962/63 season. Sea temp. varying 30° - 31°F .
- 1900 Course 022° up West Coast of Adelaide Island. Barometer falling steadily. Wind NE, force 6. Short swell reaching height of 10-11 ft. During afternoon several snow squalls; visibility then reduced to a few yards, otherwise generally moderate.



Barograph trace from *John Biscoe*.

31st March 1963

- 0000 Wind reached force 7 from NE. Increasing in intensity soon after to force 8, gusting to force 9.
- 0100 After two hours of fine weather snow commenced, becoming continuous moderate to heavy. Visibility reduced to less than a ship's length (200 ft). Swell increased in height but not in period. Freezing spray continually covered whole of ship. At this time the barograph trace left the chart at 952 mb.
- 0300 Barograph trace reached bottom of chart. Continued to fall. Barograph set 10 mb. high.
- 0700 Snow remained continuous throughout middle watch. Visibility only a few feet. Wind force 10 still from NE. Sea now reached 20 ft. with a short period. Ship's speed, already down to 5 kt., reduced further. Air temp. 28°F. Sea temp. 30.5°.
- 0730 Fall of barometer checked at a low of 941.8 mb. At this point it rose vertically for 2 mb. Force 10 wind died immediately to calm. Barometer steadied and the wind backed 180° to the SW and increased to force 6. The wind was now acting against the swell and the height of sea increased further to what must have been at least 30 ft. Change in conditions necessitated the ship having to turn and run before the wind as the spray was freezing right overall. Due to the high swell ahead very little change in the situation.
- 0830 Swell remained precipitous throughout past hour. The ship continually plunged into the seas, the fo'c'sle and fore deck disappearing under a mass of water and spray. One description was that the ship seemed to hit a vertical wall of water which did not divide as it hit but continued until it was flat up against the bridge front. With that wave several stanchions on the fo'c'sle head were bent and snapped under the weight of the water.
- 1000 Barometer commenced to fall again gradually levelling out. Wind still SW, force 6.
- 1345 Barometer steadied then rose vertically, gradually easing to a steady climb. No increase in wind but with rising barometer the snow ceased and the visibility increased from a ship's length to 8-10 miles. Cloud broke to W revealing large expanses of blue sky.

- 1500 Improved conditions; wind eased to force 5. Ship proceeding at full speed for base at Argentine Islands since 1355.
- 2000 Barometer continued to rise with a more gradual slope. Wind eased to force 3 still from sw. Barometer reached 952 mb.
- 2022 Arr. Argentine Islands.

With daybreak, 31st March, the scene on the forepart of the vessel revealed the result of the breaking seas. The ship was covered with ice over the shrouds, foremast and bridge, front and sides. The thickness was a good two inches. Two launches plus a small dinghy on the fore deck were completely cocooned with ice. No icebergs were encountered during the night, which was fortunate as during most of the night the ship was without radar due to icing of the scanner from the spray and because of a blown fuse. No bergy bits or growlers were met with, which again was fortunate as in the very poor visibility it would have been impossible to see them.

Note. The *John Biscoe* appears, on this occasion, to have experienced storms, depressions and troughs associated with the interaction of air from the antarctic ice cap with the air mass of the southern hemisphere westerlies. The severe conditions described must occur frequently in this area.

SANDSTORM

Aden Harbour

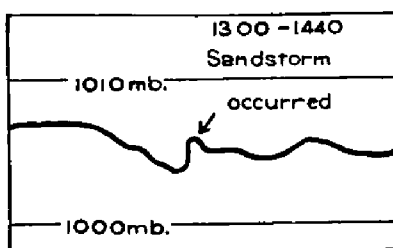
m.v. *Cannanore*. Captain J. A. Clifford. Port Sudan to Aden. Observers, the Master and all deck officers.

20th June 1963

- 1300 Wind s, force 3. Air temp. 89°F, wet bulb 83°.
- 1330 Sudden change of wind direction, veering to NW and increasing.

Cloud of dust having an angular width of about 40° approaching from a NW'ly direction. Height estimated to be from sea level to about 500–800 ft. Wind freshened to force 6 from NW. Visibility down to 500 ft. at times. Harbour waters became confused causing all small craft to seek shelter. Barges being tossed about.

- 1440 Wind eased to force 4, with dust and sand subsiding, but haze present.
- 1530 Wind force 2 but backing to s'w.
- 1700 Wind s'w, force 3. Air temp. 90°F, wet bulb 78°.



At the onset of the storm the barograph rose 2 mb. quite suddenly; later it fell 1 mb. After the wind veered to NW, the air felt remarkably cool due to the decrease in humidity.

Note. The Daily Weather Report issued by the Meteorological Department of the United Arab Republic, Cairo, shows that at 1200 GMT a trough of low pressure associated with the Indian Monsoon extended from India to the south-east end of the Persian Gulf and to west of Aden and hence to the east of Addis-Ababa. The sudden veer of wind and the accompanying sandstorm occurred when the trough passed the Aden area as it moved very slowly south-eastwards. The subsequent return of the wind to its former direction, later in the afternoon, must be due to irregularities in the movement of the trough.

SANDSTORM AND DRY AIR

Suez Bay

m.v. *Chindwara*. Captain F. A. J. Downer, D.S.C., R.D. Port Sudan to Suez. Observers, all officers.

25th May 1963

- 0400 Wind increased to force 5 from SSE. Sea steadily increasing. Air temp. 76°F.
- 0730 Wind SSE, force 6.
- 0930 Wind SSE, force 8. Many ships dragging anchor. Air temp. 77°.
- 1200 Wind s'ly, force 5.
- 1300 Wind veered to w's and increased to force 6.
- 1330 Wind w's, force 4, and air becoming filled with sand. Air temp. rose rapidly to 98.5°.
- 1400 Air temp. 100°, wet bulb 67°. Visibility 3 miles. Standing in the wind was very unpleasant due to the particles of sand and the high air temperature.
- 1530 Air temp. 100°. Visibility 1½ miles.
- 1600 Air temp. 99°. Visibility improved to 4 miles.
- 1700 Wind w's, force 3-4. Air temp. 96°, wet bulb 67°.
- 1800 Wind w's, force 2. Air temp. 94°, wet bulb 67°. Very little sand in the air, visibility now good.

Position of ship: at anchor by Green Island.

Note. Examination of the charts issued by the Meteorological Department of the United Arab Republic, Cairo, indicates that a frontal depression was centred just to the west of Port Said at 1200 GMT, the cold front lying over Cairo and Fayoum and thence south-westwards. The sudden veer of wind at about 1300 occurred when the front crossed Suez Bay. Although the air temperature normally falls in the rear of a cold front, it did not on this occasion do so, because the relatively cool southerly sea breeze ahead of the front was replaced by a westerly wind markedly warmed by its passage across the desert around the time of day when heating is near its maximum. This occurred in air probably originating in south Russia. Its low dew point of 38°F (dry bulb 100°, wet bulb 67° and relative humidity 12%) demonstrates that if air comes from a cool region where dew points are low the dew point tends to remain low even after being heated over land. However, turbulent atmospheric mixing over the sea especially where sea surface temperatures are high causes rapid upward transfer of moisture from the sea surface and a relative humidity of 12% would rapidly increase over the sea to at least 60%. Ships can therefore experience such low humidities only under special conditions.

CHANGE OF TEMPERATURE IN BANK OF MIST

China Sea

m.v. *Denbighshire*. Captain C. B. R. Goodman. Manila to Hsinking. Observer, Cadet Officer Hammonds.

1st April 1963. At 0915 GMT, a bank of mist was seen stretching from horizon to horizon. Upon entering the bank the wind veered from s'E, force 3, to N, force 5. The cloud which had earlier been 2/8 Cu. rapidly became 8/8 St. and the temperature fell to 54.5°F, having previously been 66° four hours earlier. Visibility was about 4 miles and it remained so until 1015 when both cloud and mist cleared.

Position of ship: 29° 52'N, 124° 01'E.

Note. Reference to the Daily Weather Maps issued by the Japan Meteorological Agency shows that a cold front lay at 0900 GMT on 1st April 1963 from south of Hangchow-Wan to near Nagasaki and hence north-eastwards over Honshu. All the changes of weather reported by m.v. *Denbighshire* are entirely consistent with a passage through the frontal belt, out of the warm air on the south side and into the colder and clearer air on the northern side.

FALL OF SEA TEMPERATURE: SEA SMOKE: CURRENT RIP

North Atlantic Ocean

s.s. *Sylvania*. Captain J. Crosbie Dawson, D.S.C., R.D. Cobh to New York. Observer, Mr. J. G. Parry, 2nd Officer.

6th May 1963

GMT	TEMPERATURES °F			REMARKS
	DRY BULB	WET BULB	SEA	
2100	51	49	71	Nothing unusual observed. Wind NE, force 5.
2105	50	48	71	Conspicuous current rip observed 1 mile to north, aligned 240°-060° for many miles.
2110	48	46.5	71	Sea smoke forming around ship, to a height of about 5 ft. Waves noticeably 'piling-up'.
2115	47.5	46	71	Sea smoke well established from the line of current rip to the southern horizon.
				Sea smoke increasing in height.
2120	46.5	45.2	50	Height of sea smoke now 15-20 ft. Plainly noticed that there was no smoke to the north of the rip.
				To the sw the sea smoke dense enough to obscure the waves at a distance of one mile.
				Ship now running along the line of the rip.
2125	45.5	44	48	Height of sea smoke about 20 ft. at the ship. Fog bank 2 miles to the south.
2130	44.5	43	51	Fog bank now estimated as 150 ft. high to port—still 2 miles away. Full visibility ahead and to starboard. At 2140 crossed the 100 fm. line—George's Bank.
2135	44	42.5	44	Ship now in clear water and observing the smoke from a distance. Current rip and ship diverging but line of smoke visible 4-5 miles away to port.
2150	44	42.5	43	Binoculars now required to see the smoke.
2200	43.5	42	42	

Some four hours earlier the ship crossed from a sea temp. of 38° to 62° without any phenomena being seen. Course 258°. Speed 20 kt.

Position of ship at 2100: 40° 57'N, 66° 28'W.

Note. During the latter stage of her voyage westwards, s.s. *Sylvania* was gradually edging out of the Gulf Stream and into the Labrador current. In this part of the North Atlantic the rate of change of sea temperature with latitude is large, but the observed fall of temperature from 71° to 42° is somewhat greater than normal. The reading of 71° is one which is not likely to be often exceeded in this region in the month of May—it is attributable to the intrusion from the south of a tongue of abnormally warm water.

The sea smoke observed is not unexpected in view of the large excess of sea temperature over air temperature in the vicinity and the existence of the fresh NE'ly winds. The unusual distribution of the sea smoke is probably due to large local irregularities of sea temperature distribution.

CURRENT RIP

off Sierra Leone

s.s. *Clan Macaulay*. Captain G. B. Owen. Cape Town to Dakar. Observer, Mr. A. K. Deacon, 3rd Officer.

9th May 1963. At 0810 GMT the vessel entered a strong current rip some 1200 ft. wide, running 120°-300°. The surrounding sea was very slight, but in the rip the disturbance resembled that produced by a wind of force 3-4 (the period, of course, being much shorter). The vessel, on a course of 319°, was deflected 10° to starboard

although 25° of port helm was applied; after clearing the rip steering became normal. Several other rips of lesser intensity were encountered during the following 6 hours. The depth of water was 84 fm. in the first rip. Sea temp. 77°F. Wind N, force 1-2.

Position of ship: 9° 20'N, 16° 00'W.

Note. The current rip occurred in the general area where the east-going Equatorial Counter-current converges with the branch of the Canary Current moving se'wards off the Coast of Sierra Leone.

off Galapagos Islands

m.v. *Hurunui*. Captain S. W. Andrews. Balboa to Auckland. Observer, Mr. F. Lafferty, Jnr. 3rd Officer.

12th April 1963. The ship passed through a marked line of very confused water at 2305 GMT when passing to the North West of the Galapagos Islands. In the turbulent area the sea was bubbling up into white foam, but on either side of it the water had a different colour. The disturbed water extended as far as the eye could see in a direction 168°-348°.

No change in the temperature of the sea was noticed; it remained constant at 84°F. Wind SSE, force 3. Sea slight.

Position of ship: 1° 53'N, 92° 28'W.

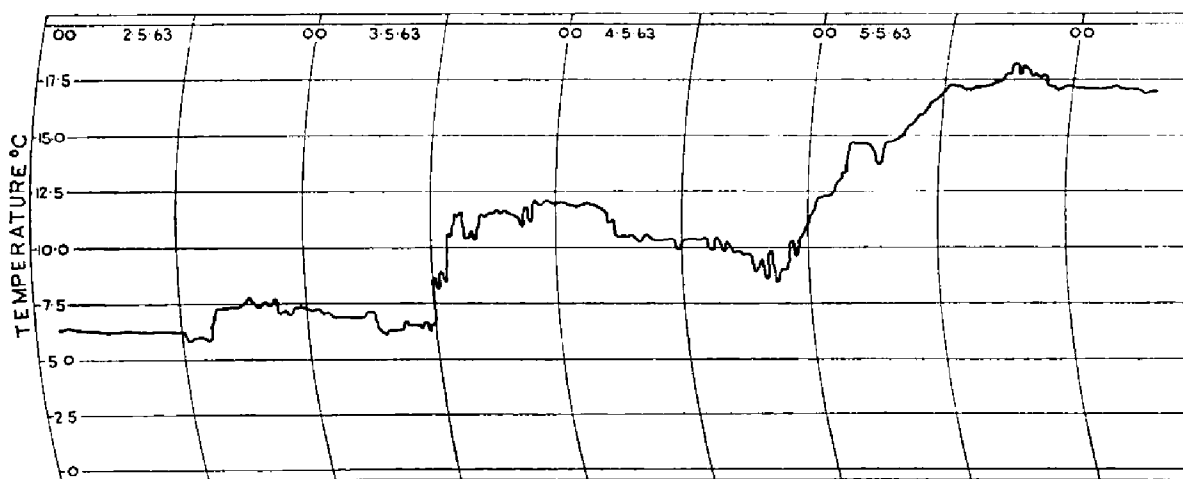
Note. Current rips are well known in the vicinity of the Galapagos Islands and are due to the interaction between the east-going Equatorial Counter-current and the beginning of the northern part of the west-going South Equatorial current between the equator and about 4°N. This rip was probably associated with the complex flow of the cold Peru current where it branches into the Gulf of Panama and where it merges with the equatorial current.

CHANGES OF SEA TEMPERATURE

South Atlantic Ocean

R.R.S. *John Biscoe*. Captain W. Johnston. Port Stanley to Montevideo.

2nd-5th May 1963. The tracing from the D.R.T. sea thermograph here reproduced shows the very considerable changes in sea temperature encountered on the voyage from Port Stanley to Montevideo.



Note. In the area of this observation the north flowing Falkland current interacts with the south flowing Brazil current in some ways like the Labrador Current interacts with the Gulf Stream. Rapid changes of sea surface temperature can occur where the two currents meet.

North Atlantic Ocean

m.v. *Trecarne*. Captain L. J. Annett. Manchester to Montreal. Observer, Mr. J. Carmichael, 2nd Officer.

19th April 1963. The following changes in sea temperature (condenser intake) were observed between 1535 and 1930 GMT:

1535: 39°F; 1623: 42°; 1700: 39.5°; 1730: 40.4°; 1800: 40.2°; 1835: 58°;
1900: 63°; 1930: 62.9°.

Course 198°, 13 kt.

Position of ship at 1800: 42° 00'N, 58° 42'W.

Note. m.v. *Trecarne* was passing from the Labrador current into the Gulf Stream. In this part of the North Atlantic Ocean the rate of change of sea temperature with change of latitude is normally very great. The rise in temperature found by the vessel, although large is by no means abnormal.

DISCOLOURED WATER

North Atlantic Ocean

m.v. *Port Pirie*. Captain L. J. Skailes. Las Palmas to Cape Town.

4th May 1963. Large irregular patches of discoloured water were observed between 1200 and 1300 GMT. A sample taken appeared unremarkable except for two small organisms barely visible to the naked eye. They were less than $\frac{1}{16}$ in. long and appeared to consist of a head and tail which was about $\frac{3}{8}$ the total length of the body. When the sample of water was agitated the two creatures darted about for 3 or 4 sec., otherwise they lay dormant. Sea temp. 74°F. Wind NNW, force 4.

Position of ship: 10° 13'N, 16° 13'W.

Note. Dr. T. J. Hart comments: "The vessel was in the Canary Current. Plankton blooms of various kinds are known to occur in this area. The organisms causing them are usually far too small to be distinguished without the aid of a microscope."

Indian Ocean

s.s. *Benmacdhui*. Captain W. G. Watson. Aden to Penang.

4th April 1963. At 0700 GMT plankton of a yellow colour was seen lying in two distinct bands about a mile apart, each band being about $\frac{1}{4}$ mile broad and stretching in a N-S direction from horizon to horizon. Wind NE'E, force 2.

Position of ship: 8° 53'N, 68° 19'E.

5th April. At 0510 patches of yellowish brown scum, presumably plankton, were observed in a narrow band lying 070°-250°. The band was about 200 yd. long and the patches averaged 2-3 ft. across.

Position of ship: 7° 50'N, 73° 45'E.

5th April. At 0740 a bank of yellowish brown plankton with green streaks through it was seen stretching for 200 yd. It was 2-3 ft. wide.

Position of ship: 7° 36'N, 74° 25'E.

6th April. At 0848 patches of yellow plankton were observed. Intermingled with them were various types of sea weed and a good number of dark brown objects shaped rather like Badminton shuttlecocks.

Position of ship: 5° 50'N, 80° 48'E.

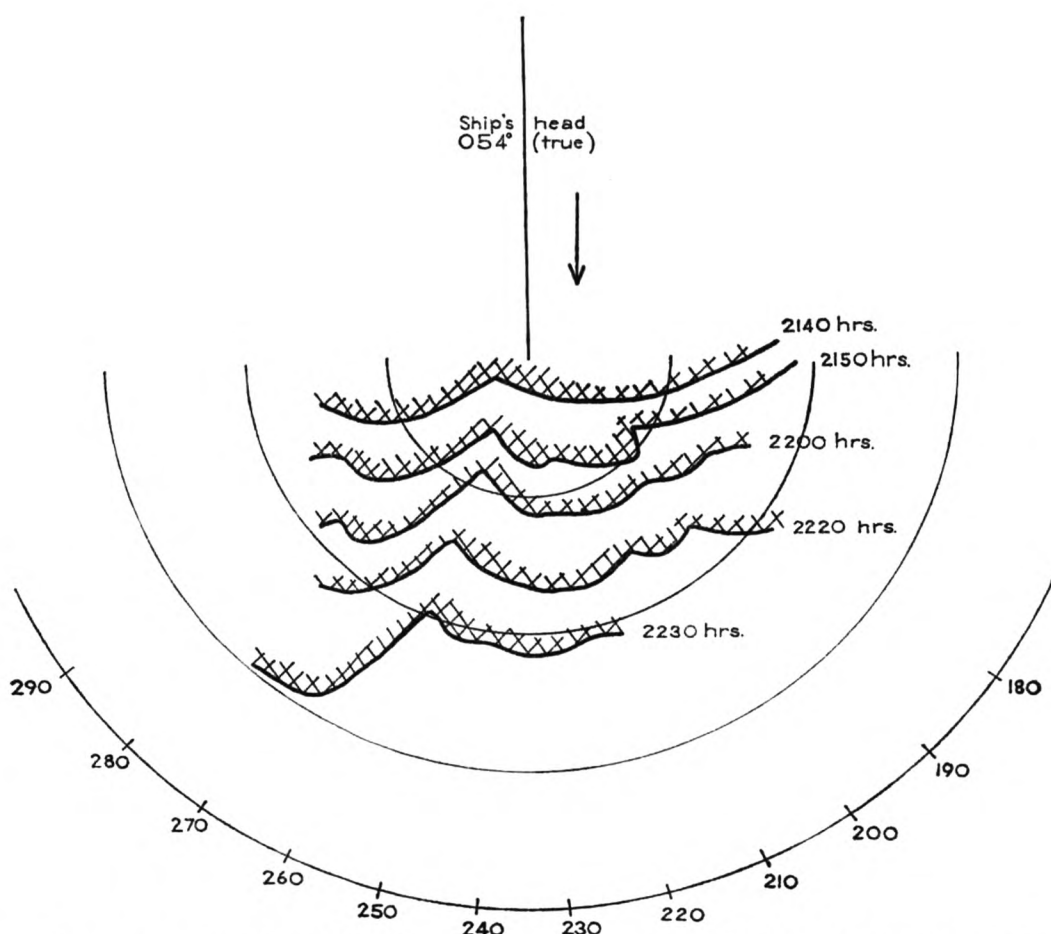
Note. Dr. T. J. Hart of the National Institute of Oceanography comments: "These four reports of plankton blooms at positions in the Western Indian Ocean help to support our present ideas on the seasonal frequency of the phenomenon there. The dark brown shuttlecock like objects seen with the bloom to the south of Ceylon could have been *medusae* or even small squids."

FRONT AS SEEN ON RADAR SCREEN

North Atlantic Ocean

m.v. *Essex*. Captain S. G. Robinson. Curaçao to Hull.

21st June 1963. At 0040 GMT the wind was observed to veer sharply from w, force 5, to NNE, force 6, accompanied by a heavy rain shower. Pressure fell steeply



by 0.9 mb. to 1013.5 mb. while the temp. fell by 2°F to 68.5°. The wind continued to increase gradually and by 0115 GMT was NNE, force 7. Dewpoint 63°F. Sea 72°.

The appearance of the front as seen on the radar screen is shown in the accompanying diagram.

Position of ship: 34° 48'N, 42° 15'W.

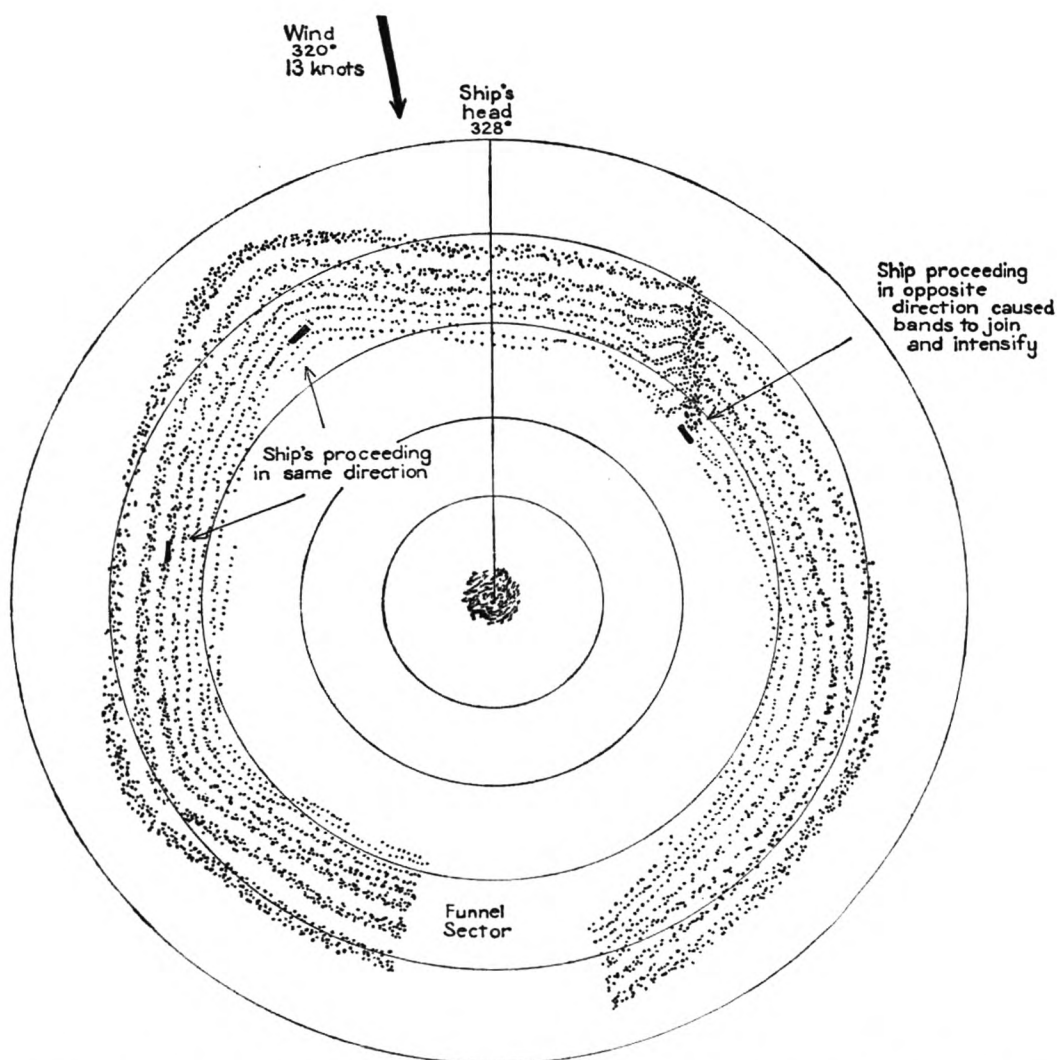
Note. At 0000 GMT a slow-moving cold front lay from approx. 32½°N 65°W to 33°N 45°W to 34°N 40°W hence ENE'wards. There was a very pronounced change of wind direction across the front, the wind on the north side of the front being NE'ly: on the south side the wind was WSW'ly.

RADAR INTERFERENCE

Red Sea

m.v. *Glenorchy*. Captain H. S. Clarke. Aden to Suez. Observer, Mr. P. A. Leece, 3rd Officer.

29th June 1963. Between 1430 and 1630 GMT while on passage through the Red Sea, the radar interference shown in the diagram was experienced. It took the form of concentric bands about the ship, generally at a distance of about 6–8 miles away. For the most part there were 8 bands but in some places 12 could be counted. The furthest away was the broadest, 3–4 cables, while the nearest was the narrowest, being about ¼ cable wide. The spaces in between the bands also increased with increasing distance away. The exact shape of the bands was never constant but was at all times changing slowly. Sometimes a part moved towards the ship, sometimes it moved away; occasionally a part would fade, or bands would virtually join, at times becoming quite solid. This form of interference persisted for about two hours. Both before and after this time, the interference showed no definite form but quite often it resembled second trace echoes from the mountains on either side, though we doubted that this was really the case as the shape was continually changing. At one stage, the passing of a ship in the opposite direction caused the bands to join



and become solid, as shown in the diagram. Ships going in the same direction as ours made no difference to the shape of the bands.

Visibility was excellent, mountain tops 3,000 ft. high being seen at 50 miles distance; there was a slight yellow haze opposite to the sun. Smoke from ships spread out into a layer, indicating the presence of a temperature inversion which we thought was probably the cause of the phenomena. Air temp. 87°F, wet bulb 76°, sea 82°. Wind NW, force 4. Sea slight to moderate.

Position of ship from 1430-1630: 26°N, 35°E.

Note. Captain Wylie, Director of the Radio Advisory Service, comments:

"The explanation is in terms of back-scattering from the sea at ranges down to the 'skip' distance associated with one hop ducting.

Glenorchy's observation is most interesting in that two rays must have been present to produce 'bands', one reflected from a layer which works out to be about 200 ft. high (assuming X-band radar) and one travelling along the surface. The interference between these two rays produces zones of strong field at the sea alternating with zones of weak field as the distance from the ship increases. These zones will be concentric with the ship if the duct is uniform over the sea, and back-scattering from the sea is seen in the strong-field positions. This mechanism explains the increasing separation between bands as the radius is increased.

The modification of the range of these bands by other ships is interesting and is probably due to the alteration of the level of the sea in the ship's wake; a slight lowering of level would produce a much greater change in range owing to the small elevation-angle of the ducted ray. Presumably a bigger and faster ship would produce much bigger effects of this kind than smaller, slower ships. In addition, the apparent effect would be greater for ships crossing the bands than those running more nearly parallel.

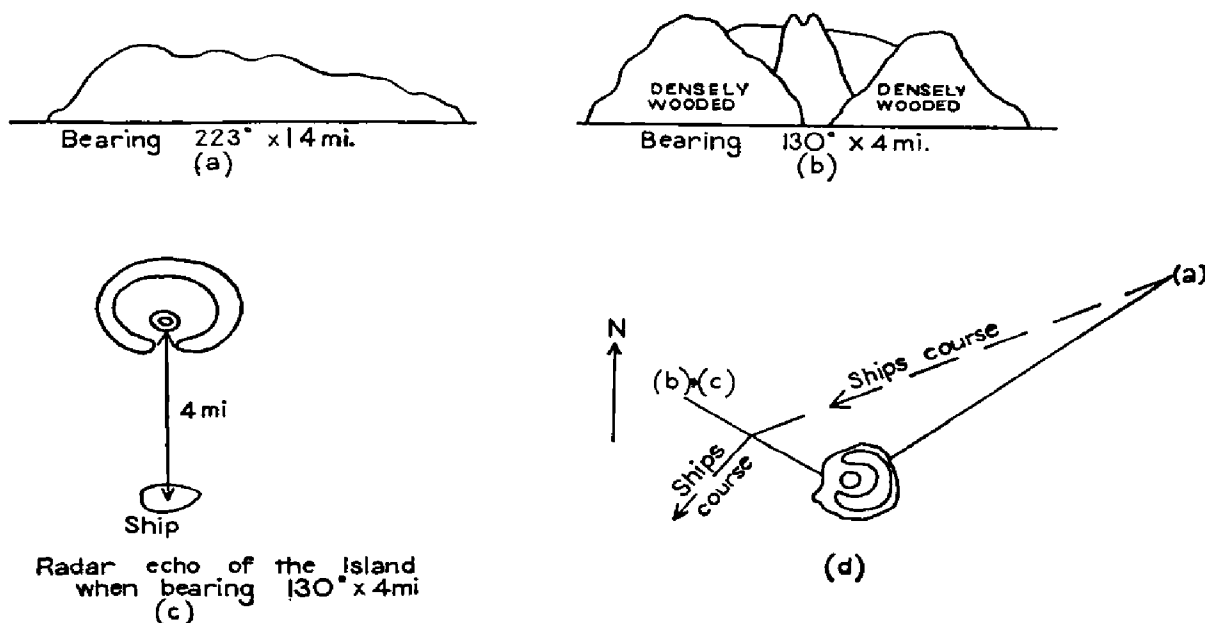
The skip zone will of course move exactly with the ship if the duct spreads uniformly over the ocean, but if the height of the duct varies then the skip-radius will alter as the ship moves, and the back-scatter zone will appear to move at a different speed from the ship."

RADAR AND VISUAL OBSERVATIONS OF BARREN ISLAND

Andaman Sea

m.v. *Herefordshire*. Captain A. N. Williamson. Rangoon to Colombo. Observers, Mr. D. Jones, Senior 3rd Officer and Mr. R. Ferry, Radio Officer.

29th May 1963. While the vessel was on passage east of the Andaman Island, visual and radar observations were made of Barren Island, as shown in the accompanying sketches. The radar was out of order until the island was abeam. The first



visual observation was made at a distance of 15 miles. Fig. (a) shows the island's visual appearance when it bore 223°, 14 miles. The cone in the centre of the Island was not seen until the vessel was 9 miles to the north of it, the outer crater being higher than the cone (1158 ft.). Fig. (b) shows the island when it bore 130°, 4 miles; Fig. (c) shows the corresponding radar appearance. The ship's course and location of the observations in relation to the Island are indicated in Fig. (d).

Position of Barren Island: 12° 16'N, 93° 51'E.

Note. Captain F. J. Wylie, Director of the Radio Advisory Service, comments:

"This is a normal radar observation of a complex target at close range. Distortion of the echo is due to the imperfect resolution of the radar. *Use of Radar at Sea*, chapters 1 and 6 (paragraph 4) explain more fully.

It is noted that the radar was out of order until the island came abeam, but it may be worth observing that the list of radar detection ranges in appendix III of supplement No. 4 to the Bay of Bengal pilot shows that this island is detected at an average range of 30 miles and is a good radar target at 24 miles."

PHOSPHORESCENCE

North Atlantic Ocean

m.v. *Sunprincess*. Captain M. Rand. Halifax to Nassau. Observer, Cadet M. Baron.

19th April 1963. Between 0000 and 0300 GMT, phosphorescence was observed in the ship's bow wave and in the crests of other waves. It was so bright that wave crests about $\frac{3}{4}$ mile distant appeared like lights. Between the bow wave and the ship's side the phosphorescence was in the form of thousands of sparkling particles. Some of these 'exploded' into circular patches 2 ft. across, giving off a great amount of light for periods of 2-3 sec.

Position of ship: 39°N, 67°W.

Note. This report is from a Canadian Selected Ship.

Skagerrak

m.v. *Laksa*. Captain T. W. Lawrence. Grangemouth to Porsgrunn. Observer, Mr. R. S. Oakes, 2nd Officer.

15th April 1963. Considerable phosphorescence was observed in the immediate vicinity of the vessel at 0020 GMT. When a sample of the sea water was poured on the deck, minute particles flashed rapidly for several seconds then slowly faded. By 0100 no more phosphorescence was seen. Sea temp. 37.4°F. Wind s'ly, force 5. Moderate drizzle.

Position of ship: 57° 57'N, 7° 55'E.

Note. Dr. R. H. Kay of the University Laboratory of Physiology, Oxford, comments:

"Some of this luminescence almost certainly came from dinoflagellates, minute creatures which are extraordinarily sensitive to mechanical stimulation and produce their light intracellularly, i.e. within themselves and not by injecting luminous material into the sea water. They enjoy the distinction of being one of the most rapidly flashing marine species.

Sampling the sea water was useful."

Indian Ocean

s.s. *Volvatella*. Captain M. A. Neeves. Geelong to Cape Town.

14th May 1963. Between 0800 and 1200 GMT the vessel passed through a series of fog patches, in which visibility on one occasion was only 100 yd. Large patches of broken phosphorescence were visible all round, lying in a SW-NE direction: some were about $\frac{1}{2}$ mile in length and approx. 30-40 yd. wide. They did not have the usual 'milky' appearance but consisted of a multitude of very small luminous particles grouped together like huge shoals of very small fish. These had a 'bubbling' appearance as if they were rising to the surface and spreading out. It was only during fog, and in the breaks between fog banks when there was a flat calm, that they were seen. Sea temp. 60°F.

Position of ship at 1200: 37° 56'S, 134° 30'E.

Note. Dr. R. H. Kay of the University Laboratory of Physiology, Oxford, comments:

"It may be that the 'bubbling' effect was in fact caused by small fish, not themselves luminescent, but provoking bright luminescence in bioluminescent plankton by mechanical stimulation of those creatures as they brushed along the fishes' bodies. Herring drifter men have reported seeing the whole bodies of herrings brilliantly lit up in this way as they rush about among the plankton, feeding."

Gulf of Oman

s.s. *City of Coventry*. Captain T. H. Fairhurst, M.B.E. Muscat to Bandar Abbas.

3rd February 1963. Throughout the entire night, phosphorescence had been very marked, but at 2315 GMT a white line of what appeared to be breaking water showed up, stretching across the vessel's course line from horizon to horizon. On approaching closer, the line was found to be a belt of phosphorescence, and on passing through it, the brilliance was so great as to illuminate the whole superstructure of the vessel. It gave the impression of having suddenly been caught in the beam of a searchlight. The width of the belt was some 200 yd. On passing through it, the previously flat calm sea was found to be now 'boiling' with many kinds of fish both large and small. The belt of phosphorescence was visible to the naked eye for 8 miles, after passing through it, before it disappeared. The depth of water was 45 fm. Course 334°. Speed 14.5 kt. Sea temp. 74°F. Wind calm.

Position of ship: 26° 08'N, 56° 52'E.

Note 1. Dr. R. H. Kay of the University Laboratory of Physiology, Oxford, comments:

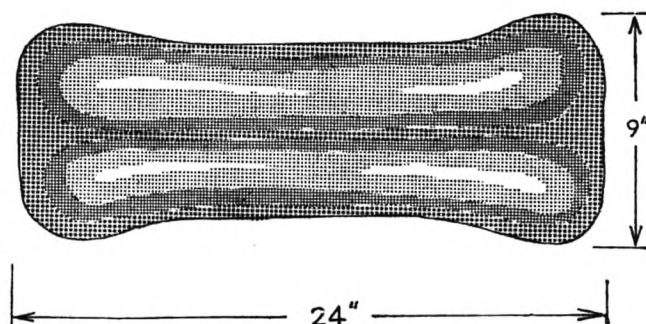
"Here again (see comment on *Volvatella* above), though it is hard to be definite after the event, it seems likely that the vigorous activity of the fish feeding in a plankton rich area was causing the luminescence, not that the fish were stimulated into wild activity by the light.

Observations of the distances at which luminescence first becomes visible and then not visible are very valuable. They can lead to quite a good estimate of the brightness of the light." *Note 2.* Dr. Kay also calls attention to the fact that the above three observations are all concerned with mechanically stimulated luminescence.

Tasman Sea

m.v. *Sussex*. Captain J. Ramsay. Wellington to Aden. Observers, Mr. J. Burn, Chief Officer, Mr. P. H. King, 3rd Officer and Mr. B. Pollard, Cadet.

14th April 1963. At 1016 GMT broad bands of brilliant phosphorescence were seen lying across the track of the vessel: they were about a mile wide and apparently not orientated in any particular direction. The phosphorescence was observed to be emanating from flat, 'bone shaped' objects approx. 24 in. by 9 in. in size. Careful



observation showed that they were of no great thickness and that the majority were lying at about 6-12 in. below the surface, though some were approx. 3 ft. beneath it.

It was noticed that a thicker 'rib' ran the length of the objects. The concentration of bands reached a maximum at 1100 and then abruptly ceased, but individual objects were occasionally seen until 1235. Attempts to obtain a specimen were unfortunately unsuccessful. The area in which the phosphorescence occurred was one in which, by day, extremely large numbers of feeding Short-tailed Shearwaters are frequently seen.

Sea temp. 63°F. Wind w'N, force 3. Sea slight. Moderate s'ly swell.

Position of ship: 39° 43'S, 152° 14'E.

PHOSPHORESCENT WHEELS

Persian Gulf

s.s. *Kent*. Captain P. P. O. Harrison. Mena-al-Ahmadi to Suez. Observers, the Master, Captain G. Bevis, Supernumerary and Mr. D. Grimes, 3rd Officer.

7th May 1963.

Captain Bevis' report. "At about 2005 SMT a most surprising display of bioluminescence began. It was visible over a large area of the sea surface through which the ship was steaming, probably covering some five miles. It took the form of luminous bands of light moving at great speed in a wave formation. At first the impression was one of extremely active phosphorescence glowing just below the sea surface and illuminating the whole area in a manner resembling the effect produced by strong reflected moonlight. As the vessel moved along, the phosphorescence was seen to be split up into large patches of varying intensity. The whole display produced the impression that myriads of organisms were being activated by fast-moving lines of energy travelling in apparently parallel bands towards the observer. The phenomena were observed for a total of 15 min., before disappearing astern."

Mr. D. Grimes' report. "A patch of bioluminescence beneath the sea surface, observed abeam to port, disappeared astern at about 2005 SMT. It was believed to have been stationary. At 2020 a further patch covering about a square mile was sighted ahead and on the port bow; it had the appearance of moonlight reflected

from a low confused swell. As the vessel approached, the patches were seen to pulsate over the whole area, apparently in the form of waves. When the middle of the area was traversed by the ship at 2030 the phosphorescence consisted of rays of light striking the surface from below. Some of them then took the form of two cartwheels, one abeam of the port bow and ahead; the other abeam of the starboard bow and ahead of it. The whole display lasted for about 15 min."

The Master's report. "When I was called to the bridge by Mr. Grimes, my first impression was of patches of frothing luminosity on the sea surface approaching the port bow, one after the other, at intervals of one second. These patches could be traced some hundreds of yards from the ship in broken lines along which the luminosity varied in intensity. The general effect was similar to the beam of light from a lighthouse flashing across a swell, that is, the light catching a crest here and there. So straight and regular were the approaching bands of light that I would suggest that the sensitive substance emitting the light was agitated by some regularly pulsating force, such as magnetic lines of force. I have previously reported such sensitivity from m.v. *Cambridge* when passing Cape Guardafui—phosphorescence being produced by the smallest flash of light from the Aldis lamp. On the occasion of the present report the ship was headed 072° and the patches were coming in from two to three points on the port bow, say 045°. The axis or focal point was a point abaft the port beam. The magnetic compass was unaffected and the switching off of the radar made no difference to the phenomena. I would like to emphasise that it was a grand spectacle quite apart from its rarity."

Sea temp. 71°F. Wind S, force 2. Clear sky with full moon. Sea rippled, no swell. Course 072°, speed 16 kt. Height of eye, 45 ft.

Position of ship at 2030: 26° 16'N, 55° 46'E.

Note. Dr. Kurt Kalle, formerly of the German Hydrographic Institute, Hamburg, comments:

"The phenomena described by the three observers show how parallel undulating waves can change to phosphorescent wheels, a form which has been most frequently observed in the Gulf of Hormuz. The extension of the patches to as much as five miles is remarkable. It is not possible from the account to say how the phenomena might be related to extraneous stimulus. Perhaps the elaborate international oceanographic researches in the Indian Ocean planned for 1963 and 1964 will throw more light on these remarkable phenomena."

Gulf of Siam

s.s. *City of Birmingham*. Captain G. G. Francis. Singapore to Bangkok. Observers, Mr. P. G. Pike, 2nd Officer and Mr. D. Stewart, Quartermaster.

17th June 1963. At 1938 GMT the vessel ran into an area of vivid phosphorescence, consisting of round patches of flashing light, some 10 feet across, which produced the effect of rotating waves of luminosity swinging past at an average rate of twice per second. The centre of the rotation remained approx. 40° on the starboard bow throughout. The estimated width of the waves was 15–20 ft. At 1950 the vessel ran clear of the phosphorescent area, the edge of which was clearly defined and running in a 270°–090° direction right to the horizon. While the phosphorescence was active, visibility was much reduced; the night was clear and dark with few clouds. Sea temp. 85°F. Wind light and variable. Sea and swell slight. Course 337°. Speed 17½ kt.

Position of ship: 6° 00'N, 103° 23'E.

FLYING FISH

South Atlantic Ocean

R.R.S. *Shackleton*. Captain D. H. Turnbull. Montevideo to Southampton. Observers, the Master, Mr. R. H. Thompson, 3rd Officer, and Mr. A. Coney, Helmsman.

10th May 1963. At 0000 GMT a flying fish hit the chart room bulk-head and landed on the port wing of the bridge. When it was measured, the fish was found to

be $12\frac{1}{2}$ in. long with a wing span of 14 in. This was by far the largest specimen anyone on board had seen and we estimated that it must have reached a height of 27 ft. before landing on deck. Can this be anywhere near a record? Sea temp. 82.4°F . Wind ENE, force 3. Swell 6-7 ft.

Position of ship: $2^{\circ} 36'\text{S}$, $32^{\circ} 06'\text{W}$.

Note. Mr. P. J. Whitehead of the Fish Section of the Natural History Museum comments:

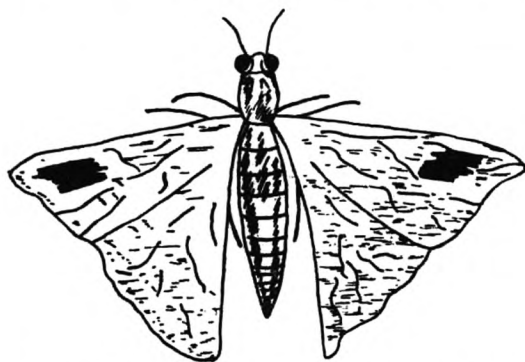
"The specimen described is fairly large, but some species e.g. *Cypselurus bahiensis*, attain 18 or 20 inches in length. I think the actual height reached during the glide is largely a matter of luck, being dependent on the wind. Most books mention 15 to 20 feet, so this particular glide appears to have been a high one."

MOTHS

Indian Ocean

m.v. *Hertford*. Captain H. C. R. Dell. Avonmouth to Hobart. Observers, Mr. J. B. Ashford, 2nd Officer and Mr. A. Marshall, Apprentice.

27th April 1963. At 0630 GMT when the vessel was some 300 miles west of Australia, about 50 moths alighted on all parts of the bridge. With the aid of a fly spray and preserving bottle some specimens were captured, one of which is shown



in the accompanying sketch. The wind, both at the time and since leaving Cape Leeuwin, had been E'N, force 4-5. Air temp. 70°F .

Position of ship: $32^{\circ} 28'\text{S}$, $109^{\circ} 20'\text{E}$.

Note. Unfortunately the specimens taken disintegrated and were not kept. Dr. C. B. Williams, our contact in the entomological world, to whom we forwarded the observation, was unable to identify the moth from the drawing alone. He comments:

"All these records of insects far from land are valuable if one can only get a correct identification."

MOCK SUN

Bristol Channel

Aux. sailing ketch *Margherita*. Captain J. N. Rose, R.D. Observers, the Master and cadets of the Reardon Smith Nautical College under instruction.

26th May 1963. At 1815 GMT when the sun bore 285° , altitude 15° , a mock sun was seen bearing approximately $262\frac{1}{2}^{\circ}$ at the same altitude. Around the sun at an angle of 22° - 23° was a halo. The rainbow colours were distinct in some cases, but very faint in others. Red towards the sun and violet away from it. The mock sun had a very definite red side and the other colours were somewhat faint, but violet was distinguishable on the outer side.

I regret I am unable to give you an indication as to how long it lasted, as I was busy tacking, training my crew and dealing with rather large sails.

Position of ship: about $\frac{1}{4}$ mile south of Nell's Point, Barry.

Note. Mock suns are two concentrations of light on the small halo at the same altitude as the sun. It often happens, as in this case that only one of the two can be seen properly and sometimes the halo itself is absent though the mock sun is clearly visible. The intensity of

these mock suns is usually very great; they are distinctly red on the inside, then yellow changing into a bluish white.

The small halo arises from reflection of the sunlight in a cloud of small ice-crystals, whose shape is known to be often that of a hexagonal prism. The mock suns occur when the axes of a large number of these hexagonal ice-crystals are vertical.

ABNORMAL REFRACTION

Gulf of St. Lawrence

s.s. *Carinthia*. Captain H. S. Challoner, R.D. Greenock to Quebec. Observers, Mr. J. K. Finlay, Jnr. 1st Officer and Mr. R. Dootson, Jnr. 3rd Officer.

29th June 1963. At 1000 SMT (1300 GMT) land was observed in an unbroken line from 035° – 120° . It was the north shore of Quebec and the coast of Anticosti Island, distant 80 miles and 72 miles respectively. There was no 'floating' refraction effect. By 1030 the land had completely vanished. The distance from West Point, Anticosti, was then about 60 miles. Air temp. 55°F , wet bulb 52° , sea 55° . Wind N'y, force 1.

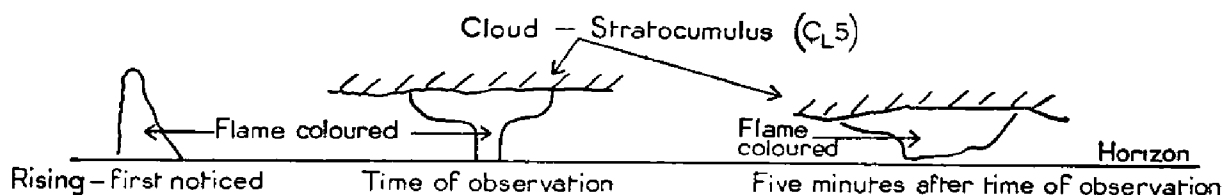
Position of ship: $49^{\circ} 23' \text{N}$, $66^{\circ} 14' \text{W}$.

Note. When the sea is colder than the air conditions are favourable for seeing objects which are normally out of the range of vision. Conversely objects which normally should be seen, may not be visible when the sea is warmer than the intervening air. In the present instance the sea and air temperatures are the same (neglecting fractions of a degree) and the conditions which determine whether the rays of light from distant objects are to be convex or concave, are in a delicate balance. This may explain why the distant land was visible at one time and shortly afterwards was invisible, though nearer to the observer.

outside Bluff Harbour

m.v. *Otaio*. Captain K. Barnett, R.D. Sydney to Bluff (N.Z.). Observers, the Master, Mr. J. Cosker, Chief Officer, Mr. R. A. Date, 2nd Officer and Mr. M. Payze, Apprentice.

15th June 1963. While approaching an anchorage outside Bluff Harbour at 1220 GMT, the moon, rising on a bearing of 105° , was seen to be grossly distorted, as shown in the sketch, and for approx. 5 min. looked like a sheet of flame in the



shape of an atomic bomb explosion. It looked very large and close, and all the observers thought it was a fire until the lower limb cleared the horizon. Air temp. 48°F , sea 52° . Wind NW'y, force 3. Cloud, $1/8 \text{ Sc}$.

Position of ship: $46^{\circ} 37' \text{S}$, $168^{\circ} 20' \text{E}$.

Note. At the time of the observation an unstable w'y airstream covered the South Island of New Zealand, a circumstance which implies that the temperature of the air falls with increasing height above the surface. The sea was warmer than the air, a condition favourable for light rays from a distant object to diverge upwards away from the earth's surface. The distorted appearance of the rising moon is due to the light rays bending away upwards and causing the moon's disc to be 'dragged out' in a vertical plane.

vicinity of Algoa Bay

s.s. *Transvaal Castle*. Captain N. M. Lloyd, R.D. Port Elizabeth to East London. Observers, Mr. G. H. Ryan, Jnr. 3rd Officer and Mr. W. Noble, Jnr. 4th Officer.

28th April 1963. From 1830–1835 GMT, Bird Island Light when 18 miles distant (by radar) and bearing 072° , had the distorted appearance shown in the sketch.



Later, Cape Recife Light seen at 22 miles had the same distorted shape. Great Fish Point Light which normally rises at 30 miles, for a 95 ft. height of eye, was observed at 48 miles.

During the time when the abnormal refraction occurred, particles of grit could be felt in the air, blown from the sand dunes on the coast. Air temp. 73°F , wet bulb 62° , sea 62° . Wind N, force 4.

Position of ship at 1800: $33^{\circ} 54'\text{S}$, $25^{\circ} 48'\text{E}$.

Note. When the sea is colder than the overlying air, as in the present case, distant objects, which would normally be invisible, are often seen, the rays of light from them tending in these conditions to follow the curvature of the earth, thus bringing objects below the horizon into view.

LUNAR HALO COMPLEX

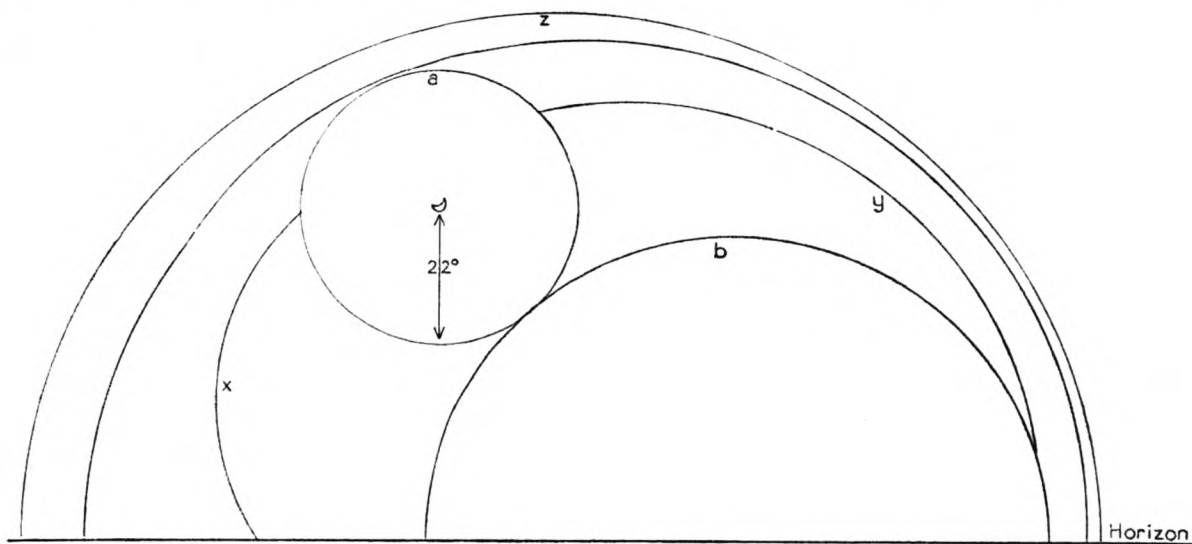
Indian Ocean

s.s. *Devon*. Captain I. C. Davison. Adelaide to Aden. Observer, Mr. D. Southworth, Jnr. 3rd Officer.

29th May 1963. Between 1515 and 1520 GMT when the moon was at an altitude of 60° and bearing 302° , the halo complex shown in the sketch was observed. The halo (a) and the arc (b) formed first; (x) and (y) appeared at the time when (a) and (b) touched. The arc (z) formed when (x) and (y) moved outwards and joined: the whole system faded when (z) lay along the top of (a). The amount of Cs. increased during the afternoon, being 8/8 at 1800.

Position of ship: $2^{\circ} 21'\text{S}$, $62^{\circ} 33'\text{E}$.

Note. This very complex system cannot be explained by any simple theory of haloes.



RED FLASHES AT MOONRISE

Gulf of Aden

m.v. *Calchas*. Captain R. C. Riseley. Aden to Singapore. Observer, Mr. S. V. Sharp, Officer Cadet.

10th May 1963, 1643–1646 GMT. Three minutes before the full moon rose, a red glow appeared in the sky about 10° on each side of the bearing 115° . The glow became pink then dark yellow as the moon appeared above the horizon. As it continued to rise, the sides of the moon appeared to trail downwards to the horizon, until the moment when the lower limb cleared the horizon, at which point a reddish flash occurred. At 1800: Air temp. 84.4°F , wet bulb 80.0° . Sea 84.5° . Visibility very good. $1/8$ Ac.

Position of ship: $12^\circ 36'\text{N}$, $46^\circ 36'\text{E}$.

Note. This is an example of the red flash at moonrise, which corresponds with the well known green flash at the setting of the sun. It is rarely seen particularly with regard to the moon. However, the colours observed when the moon first appeared were due to abnormal atmospheric optical refraction and scattering. The final flash of red was the true 'Red Flash'. It is probable the conditions were especially favourable for this phenomenon.

EXCEPTIONAL VISIBILITY

off New South Wales

m.v. *Rona*. Captain W. McClelland. Observers, the Master and Mr. F. Black, 2nd Officer.

25th May 1963. At 0300 GMT while the vessel was on course 232° , 77 miles from Sugar Loaf Lighthouse (N.S.W.), Mt. Cairncross (1,753 ft.) was observed bearing 290° ; Middle Brother (1,824 ft.) was seen bearing 268° . These fixed the vessel's position as 59 miles from Mt. Cairncross and $55\frac{1}{2}$ miles from Middle Brother. Half an hour later the South Brother (1,617 ft.) was visible. Air temp. 67°F , dew point 55° , sea 70° . $6/8$ C_M1. Wind NW, force 2.

Position of ship: $31^\circ 40'\text{S}$, $153^\circ 46'\text{E}$.

Note. The following comment upon this observation, which is from an Australian Selected Ship, has been received from the Commonwealth Bureau of Meteorology Analysis Centre.

"The exceptional visibility reported was supported by the synoptic situation which indicated that a southerly outbreak had just preceded this period over the western Tasman Sea. Showers which had occurred in this southerly flow could be expected to clear the atmosphere of dust particles and other nuclei and thus make possible the visibilities reported."

VISIBILITY REDUCED BY RAIN

off Sydney, N.S.W.

m.v. *Afric*. Captain R. T. Welch. Sydney to Aden. Observers, the Master, Mr. J. D. Allen, 3rd Officer and Cadet Williams.

9th April 1963. From 1230 GMT onwards there was much vivid lightning and occasional thunder from large Cb. clouds. The light rain which had been falling changed at 1310 to torrential rain which was so heavy that it caused visibility to be reduced to about 100 ft., the fore part of the vessel not being visible. The wind increased to force 8 and veered seven points to SE. Very heavy hail fell between 1315 and 1325; some of the stones appeared to be as large as golf balls. The rain ceased at 1345 and visibility improved to over 10 miles. At 1400 GMT the wind backed sharply to ENE, force 4. Continuous lightning was seen astern for several hours.

Position of vessel: 8 miles south of Sydney.

Note. This remarkably severe storm was associated with the passage of a cold front which moved north east off New South Wales.

SPECTRE OF THE BROCKEN

South Atlantic Ocean

m.v. *Port Pirie*. Captain L. J. Skailes. Las Palmas to Cape Town.

13th May 1963. From 0130-0200 GMT the vessel was proceeding in moderate or thick fog. The observer noticed that while he was standing on the starboard wing of the bridge his shadow was cast on the fog by the moon which was low in the SE.

The shadow was encircled by a white bow, approx. 25° in radius, which showed faint colours of the spectrum. Air temp. 57.6°F , sea 57° . Wind N, force 4.

Position of ship: $33^\circ 54'\text{S}$, $18^\circ 06'\text{E}$.

Note. This is a typical example of the Spectre of the Brocken, which is usually seen when the sun casts the observer's shadow on the fog. It is unusual to see the phenomenon by moonlight and in particular to be able to see any coloration in the bow.

RE-ENTRY OF ARTIFICIAL EARTH SATELLITE

Arabian Sea

m.v. *Cardiganshire*. Captain A. Lane. Aden to Penang. Observers, Mr. S. Barnes, 2nd Officer and Mr. P. Stananought, Cadet Officer.

26th April 1963. A shower of what was taken to be meteorites was seen entering the atmosphere from the SW at 2120 GMT. They were estimated at from 50-70 in number and were moving in a N'yly direction. The colour ranged from a brilliant green to bright white and the trails which were left covered a quarter of the sky. The total duration of the observation was 45 sec.

Position of ship: $11^\circ 38'\text{N}$, $53^\circ 39'\text{E}$.

m.v. *Silverforce*. Captain H. H. Howey. Singapore to Suez. Observers, Mr. M. C. McGregor, 2nd Officer and Mr. C. McLean, Apprentice.

26th April 1963. A brilliant object was seen at 2117 GMT bearing 222° at an altitude of about $18\frac{1}{2}^\circ$. It passed across the sky from S to N finally fading from sight when bearing 334° , altitude approx. 8° . The duration of the flight was about 35 sec. The meteor (if such it was) consisted of three sections, the leading part, quite faint, being followed by a ball of intense white light whose circumference varied from red to green in colour. The ball, which was about 10' in diameter, had a tail behind



Tail composed of brilliant
reds, golds, whites and
greens in quite separate
and distinct flashes

Intense white ball
of light, edges of ball
varied their colours
from red to green

Two vertical bands of
a few flashes of light
red, green and blue
in colour

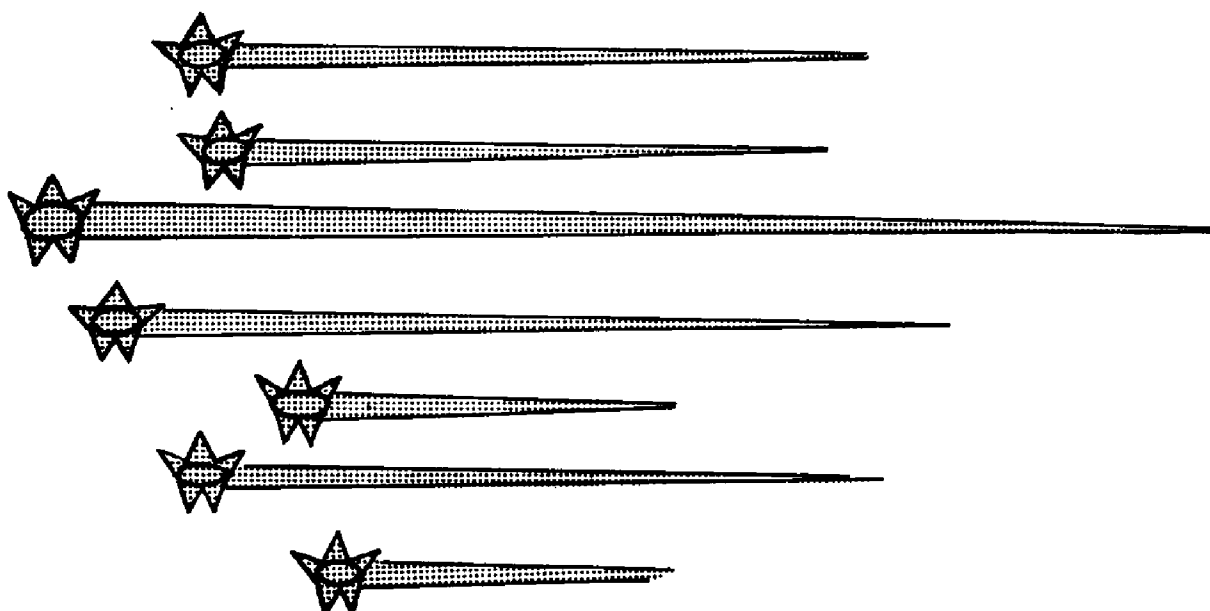
it approx. $2\frac{1}{2}^\circ$ in length and this gave off brilliant red, gold, white and green flashes of light. The general appearance may be seen from the accompanying sketch.

Position of ship: $12^\circ 48'\text{N}$, $54^\circ 08'\text{E}$.

Gulf of Aden

s.s. *British Ambassador*. Captain J. H. Lemon. Suez to Mena-al-Ahmadi. Observers, Mr. J. G. Bell, 2nd Officer and Mr. J. Morrison, A.B.

26th April 1963. At 2118 GMT a brilliant white light appeared on a bearing of approx. 130° at an altitude of about 12° - 15° . It broke into 7 parts which traversed the sky on a course of 320° the time taken being approx 1 min.; the altitude decreased at the end of the flight to 8° - 10° . The seven lights had long tails which changed



from white to green as they passed ahead of the ship, and the brilliance was such that they produced bright reflections from the sea surface. The general appearance is shown in the accompanying sketch. There was no cloud present at the time.

Position of ship: $14^{\circ} 19'N$, $49^{\circ} 48'E$.

Note. Mr. H. B. Ridley, Director of the Meteor Section of the British Astronomical Association, comments as follows:

"The reports from *British Ambassador*, *Cardiganshire* and *Silverforce* clearly referred to something other than a normal meteor, and I therefore investigated the possibility of other identifications. Mr. H. G. Miles, Director of the Artificial Earth Satellite Section of the B.A.A., kindly suggested that the object might have been a Thor-Agena 'restricted information' satellite launched from the U.S.A., since that object was thought to have burned out at approximately 2120 GMT on 26th April 1963, and the direction of flight of the reported object was consistent with that identity.

I then wrote for confirmation to Dr. John A. O'Keffe, of the Goddard Space Flight Centre (National Aeronautics and Space Administration), who took the matter up with Mr. G. Harris, who put the question to NORAD (U.S. Naval Observatory Radio Astronomy Department) and the final conclusion was that, although there was a discrepancy in the position, possibly due to approximate observations and uncertainties in the exact form of the decay orbit, the object was in fact the re-entering satellite 1963-07-A.

All the gentlemen mentioned above are thanked for their part in making this identification, and of course all credit is due to the ships' officers concerned for having made their valuable and interesting reports."

AURORA

The few reports of aurora recorded by British ships during the months April-June 1963 are shown below. The small number is of course accounted for by the combination of lack of darkness in the North Atlantic during these months and the approaching sun-spot minimum.

There were no periods of great magnetic disturbance, and cloudy conditions were reported by Weather Ships on the few occasions when the geomagnetic planetary index figure was as high as 6 during hours of darkness. m.v. *Port Victor*, near Hobart, reported that the aurora lasted for only 5 minutes on 13th May, and this useful observation is in accordance with a sudden slight increase in the reported geomagnetic activity.

As we reminded you in the last issue of *The Marine Observer*, the International Years of the Quiet Sun (IQSY) began on 1st January of this year, and geophysicists all over the globe will be engaged for the next two years in co-ordinated studies of terrestrial phenomena that have their origin in the sun. The aim is to investigate in detail the nature of the differences in these phenomena at sunspot maximum and



Photo by courtesy of the Chief Constable of Essex
Breached dyke at Norpits on the Crouch.



Photo by courtesy Mr. S. L. Holmes
Canvey's new defence: stone pitching, blockwork, steel sheet piling and concrete cap.

(facing page 77)



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Cattle on Foulness Island, huddled together on a mound surrounded by water, Monday, 2nd February 1953.



Copyright: P. A. Reuter Photos, Ltd.

Canvey Island, New Road; rescue by boat from the Winter Gardens, Sunday afternoon, 1st February 1953.

minimum. It is hoped that the years 1964 and 1965 will cover the period of minimum solar activity as successfully as the International Geophysical Year coincided with the period of greatest solar activity to occur since sunspot observations were begun over 200 years ago.

With a quiet sun, aurora will be mostly confined to the higher latitudes, but it is well to remember that sporadic outbursts can occur even around the time of sunspot minimum and these are just the events that it is important to record fully. Spectacular displays therefore will be infrequent in middle latitudes during the next year or two, but we hope to be able to record every auroral appearance. You may remember that we mentioned that during the IQSY we are plotting hourly synoptic maps showing the nature and character of aurorae in both hemispheres. In order to know the southern limits, it is important to have reports from every possible source, even if only horizon glows are seen. We depend very much on you, and also on observers in aircraft, to provide us with information of aurora over the oceans; without your assistance, large areas of our charts will be blank.

We thank all those concerned with observing and forwarding the observations to us here at the Balfour Stewart Auroral Laboratory in the University of Edinburgh.

DATE (1963)	SHIP	GEOGRAPHIC POSITION	Λ	Φ	I	TIME (GMT)	FORMS
13th Apr.	Weather Adviser	58°57'N 18°48'W	070	65	+ 72	2345	HA
14th Apr.	Weather Adviser	59°02'N 18°57'W	070	65	+ 72	0001-0130	HA, R, G
13th May	Port Victor	42°35'S 149°29'E	230	-50	- 71	1005-1010	R, DS

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; G = glow; HA = homogeneous arc; R = rays; DS = diffuse surfaces or patches.

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The Storm Tide Warning Service

BY COMMANDER J. N. N. SYNNOTT, D.S.C., R.N. (Retd.)

“Observing the tide is the greatest bore upon earth or on the water and the greatest exhaustion of a man’s patience and trial of his temper.” Herschell 1835.

The flood that swept over the east coast of England on the night of 31st January, 1953, was one of the worst disasters ever to have occurred in England in peace time. The seas rose in some places more than 10 ft. above normal. In a bare 24 hours more than 300 people lost their lives, 24,000 houses were rendered uninhabitable and more than 100,000 people found themselves temporarily homeless.

It is doubtful if the total cost of this flood can ever be assessed, but some indication can be given by mentioning that repairs to the defences alone cost over £5,000,000 in the first four years after the flood, and work still continues on improving these. Much of the 150,000 acres of land that were flooded was valuable farm land which was rendered unfertile for many years by the saline deposits. Industrial damage was also enormous.

The Formation of the Flood Warning Organisation

As an immediate consequence of this disaster, an inter-departmental Committee, presided over by the late Lord Waverley, was appointed to investigate, among other matters, the reason for the disaster, and to suggest means of avoiding or reducing the destruction in the event of a repetition of the meteorological and tidal conditions.

One of the recommendations of the Waverley Committee was that a Flood Warning Organisation (F.W.O.) should be set up, whose function would be to give warnings some hours in advance when unusually high sea levels were expected to occur on the east coast of England. Such warnings would be issued to the River Boards and other authorities responsible for the sea defences, and to the police authorities concerned.

This recommendation of the Waverley Committee was quickly accepted by the Government, and by the autumn of 1953 a Flood Warning Organisation had commenced to operate. It was decided, from a study of past records, that the danger period during which an active watch on sea levels was necessary was that between September and the following May each year, during which period the onset of gales could coincide with the higher tides.

From the outset the staff of F.W.O. was supplied by officers of the Hydrographic Department of the Admiralty and comprised either retired or active service Naval officers with experience in tidal and meteorological work. Since these officers must work in close liaison with the weather forecasters an office was provided at the Meteorological Office.

Administrative responsibility to Parliament for the co-ordination of all flood warning arrangements lies with the Ministry of Agriculture, Fisheries and Food, whilst the police arrangements naturally come under the Home Office and many of the tide gauges are provided by the Ministry of Transport. An advisory committee also exists to co-ordinate research work.

Cause of the 1953 and Similar Floods

The flood of 1953, and a previous severe one in 1928, in which 14 people were drowned and thousands rendered homeless, are quite divorced in cause from river floods such as that at Lynmouth in Devon. The F.W.O. are only concerned with floods which are tidal in origin. These are caused in the first place by the passage of a depression north of Scotland. The associated westerly winds induce a build-up in sea level there and this rise of sea level travels down the east coast of Scotland and England in the form of a tidal wave. This wave is generally known as a 'storm surge' and is usually several hundred miles in length. Scientific research carried out after the 1928 flood had already showed that these storm surges travelled down the coast at roughly the speed of the normal tide wave. Thus, a surge peak which is observed at Aberdeen will probably arrive at Immingham* about $4\frac{1}{2}$ hours later and at Southend about $6\frac{1}{2}$ hours after passing Immingham. Although this general characteristic of storm surges is a help in surge forecasting it is not universally true; nor does the amplitude of the wave remain constant. The change in both wave speed and height as it passes down the coast are in part due to local meteorological conditions and in part to changes in the depths and contours of the sea bed over which the wave travels.

In the case of the 1953 flood the storm surge increased in amplitude as it travelled down the coast because the intense depression which had originally caused it off Scotland, itself then travelled south-east across the North Sea, with accompanying north-westerly gales along our eastern seaboard.

A considerable amount of scientific work has been devoted to the study of these storm surges, but the subject is most complex and although to some extent reasons for the changes in both speed and amplitude of surges can be produced, no exact scientific method of forecasting these changes has yet been developed.

The most important element in surge forecasting, so far as the forewarning of danger is concerned, is the timing of the arrival of the surge peak in relation to the time of local high water. The range of the tides at spring tides (i.e., the approximate maximum change in tidal height between low water and high water) for four ports on the east coast is given below.

Tyne Entrance	14.3 ft.
Immingham	20.1 ft.
Lowestoft	6.4 ft.
Harwich	11.5 ft.

It can be seen from the above figures that a surge with a peak level of 10 ft. above normal would be quite harmless if it passes Tyne Entrance, Immingham or Harwich at low water there on a day of spring tides, since the maximum level then would

* Immingham is about 6 miles up-river from Grimsby.

still be below that of a spring tide high water. But a rise of 10 ft. at low water at Lowestoft would put the level there up about $3\frac{1}{2}$ ft. above that of high water springs and could in fact well cause considerable damage to property.

At the other extreme a surge of only 5 ft. passing any of the above ports at the time of high water spring tides would quite certainly cause damage and probably loss of life unless due warning had been given.

Very fortunately there has been no recorded instance of any large surge passing down the coast at, or even near, the time of high water at spring tides, and indeed there is some scientific support for the theory that surges which develop during spring tides do not have their peaks near the times of high water. But there is no absolute certainty that such a state of affairs could not arise.

The surge of 1953 occurred during the period of spring tides, but the peak passed down the coast some 4 hours before the time of local high water. Had it coincided with high water and been of the same amplitude the sea levels would have been some 6 ft. higher in Kent and Essex, with results which defy description.

Only two years ago a surge peak did pass Immingham at the time of local high water and considerable damage was caused in the Humber and Wash areas, but this was not during the spring tides. Had this surge coincided with the high water three days earlier the level would have been $2\frac{1}{2}$ ft. higher and well above the level of the 1953 surge at Immingham.

Administrative Arrangements of the Storm Tide Warning Service*

The height of the coast defence works along the east coast and in the mouths of the rivers flowing into the North Sea vary considerably from place to place; and from time to time, as improvements and repairs are carried out.

The height of high water also varies along the coast, as does the wave action caused by the wind, which depends on the degree of shelter provided by the contours of the coast line and the position of the off-shore banks. These complicated and differing conditions made it necessary at the outset in 1953 to divide the east coast between Northumberland and Kent into sections of coast line, in each of which the tidal height is approximately the same; and to arrange that separate warnings should be issued to the local authorities in each of these divisions of the coast.

All the authorities in each division have agreed to a sea level or 'danger level' which corresponds roughly to the height of the lowest or weakest defence in that area. When the meteorological and tidal conditions make it seem that the sea level will probably rise to this 'danger level' or higher, then a warning message is issued to all the authorities in the division concerned. This warning gives an estimate of the amounts by which the level is expected to exceed that of the predicted high tide, together with a forecast of the force and direction of the wind at that time. In each division a port of reference has been agreed upon and warnings issued are based on expected conditions at this port. With the aid of this data local authorities can then estimate, from their own special conditions, and from their past experience, the degree of danger they can expect, and so take the necessary precautions.

In selecting the ports of reference in each division, a place where there is a reliable tide gauge with suitable personnel to read it at all hours is a necessary factor.

The ports now in use are:

- Tyne Entrance
- Immingham
- Lowestoft
- Harwich
- Southend

Tyne Entrance serves as port of reference for the coast between Berwick and Middlesbrough. Immingham serves for the Yorkshire, Lincolnshire and Wash areas. Lowestoft serves for Suffolk and part of Norfolk; Harwich for the Essex and Kent areas, and Southend for the Thames Estuary.

* In September 1963 the title of the Flood Warning Organisation was changed to "Storm Tide Warning Service" to make it clear that it dealt only with tidal floods and not river floods.

Two types of warnings are issued by the Storm Tide Warning Service to the local authorities, as described below. Until recently these went through the Meteorological Office, to the Central Telegraph Office and thence to the authority concerned.

"ALERT": This type of message is issued about 12 hours before the time of high water at the port of reference for the area concerned. It indicates that there is a possibility that the sea level will reach danger level at the following high water.

"DANGER": This type of message is issued about 4 hours before the time of high water at the port of reference and indicates that it is probable that danger level will be reached or exceeded at the next high water. It includes an estimate of the level expected above that of the predicted level at high water.

The recipients of warning messages are at present the 14 River Boards responsible for various stretches of coast line and for the rivers leading to them, 12 local police authorities and 3 other important authorities. It is the duty of the River Boards to study the effect of the forecast rises in level and to advise the police. The police then pass on this information to the authorities and persons whose property or lives may be in danger. The precautions then taken are various. For example, ships' moorings are tended (ships in dock are naturally especially vulnerable to flooding); sandbags are put round the entrances to warehouses, basements and front doors; men are brought in to stand by or reinforce sea defences; pumps are brought into readiness; and herds of livestock are rounded up on to high land.

An important feature of flood warning messages is they are never issued direct to the public, in order to avoid unnecessary alarm. It is the duty of the police to alert the public when necessary after consulting their River Board advisers.

Methods of Forecasting Storm Surges

The fact that storm surges are caused by meteorological conditions and that therefore the S.T.W.S. must be in closest liaison with the weather forecasters has already been mentioned.

It is equally important that the S.T.W.S. should be continually aware of all changes in sea level. To that end it was arranged at the outset that actual observed hourly tidal heights at the ports of reference should be available to the Duty Officer at all times at short notice. Similarly, it is essential that abnormalities in sea levels at Aberdeen should be known, so tidal readings from there were included.

Arrangements were accordingly made with the local authorities at these places for readings of their hourly tidal heights to be passed in to the S.T.W.S. Such readings can conveniently and quickly be transmitted by telephone from the vicinity of the tide gauges to the nearest Met. O. station, and thence to the office of the S.T.W.S. through the Met. O. communications network. The system devised allows the frequency at which these readings are transmitted to be altered according to the prevailing meteorological and tidal conditions. Under calm conditions a set of 6-hourly readings is transmitted from each station at standard times daily. When a serious rise in level is possible these heights can be sent from any or all of these ports, every 6 hours, every 3 hours or every hour.

These observed hourly tidal heights are compared with similar predicted tidal heights, which are especially computed for the S.T.W.S. by the Tidal Institute at Liverpool. When the conditions are favourable for the formation of a dangerous surge the differences between the observed and predicted tidal heights are plotted graphically and from these graphs the build up of a surge at Aberdeen, and its passage down the coast, together with the relationship between the surge peak and time of local high water, can easily be seen. It is from graphs of this nature that surge forecasts are made and warnings issued.

An example of one of these graphs is given in the diagram opposite. This shows the height of sea level at 8 ports above or below the normal predicted height during the passage of a surge on 20/21 March 1961. The times of local high water at each port are shown by a thick short vertical line with a number against it along the

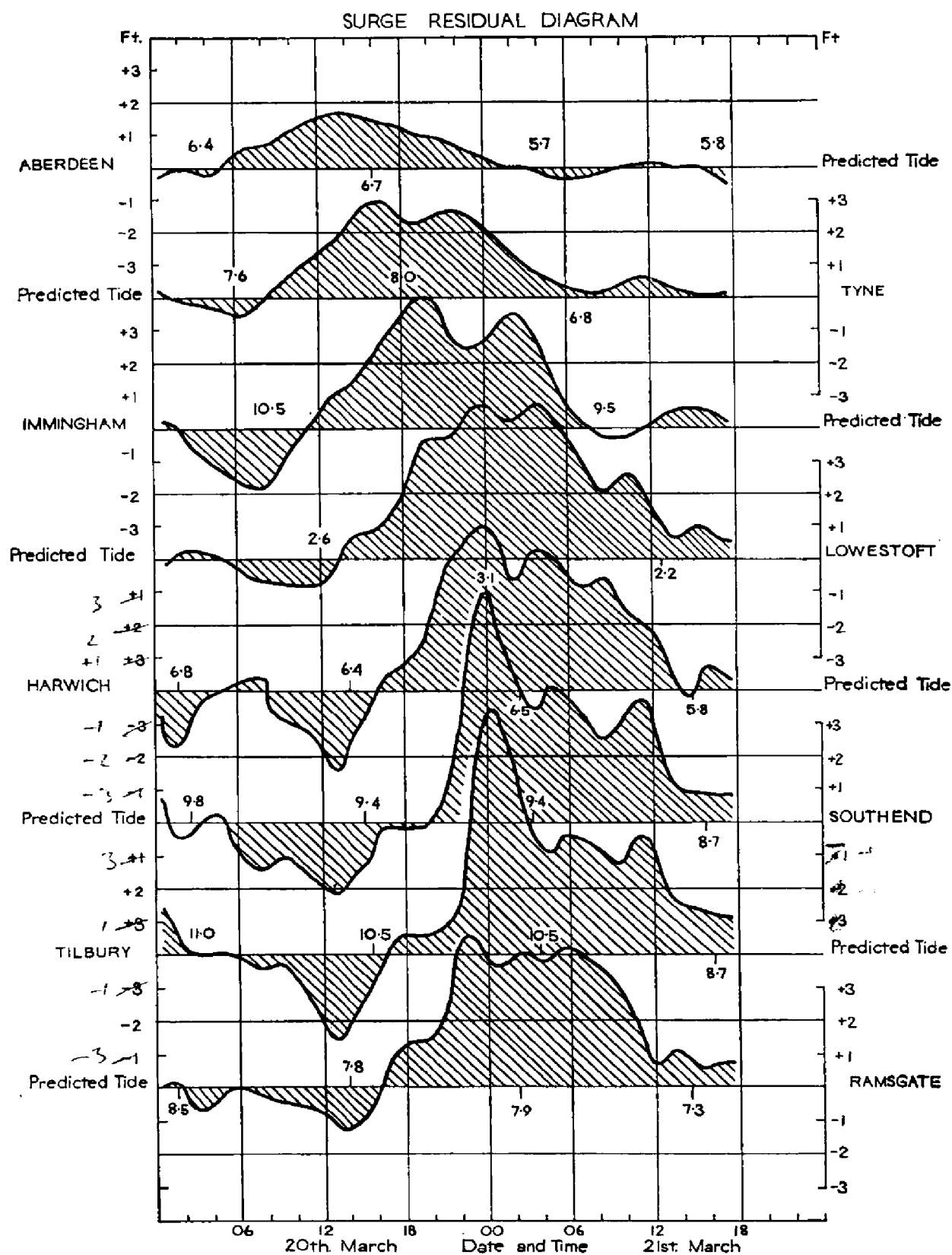


Diagram showing the progression of the great surge down the East Coast 20th-21st March 1961. horizontal abscissa. These numbers are in fact predicted heights of high water on Ordnance Datum (Newlyn).

The graph shows how a surge of less than 2 ft. at Aberdeen before high water increased in height to 4 ft. at Immingham, where the time of the peak almost coincided with the time of high water there. It also shows how, by the time the surge reached Southend and Tilbury, the peak had risen to about 7 ft. in height, but by then fortunately both peaks were occurring about 4 hours before local high water.

The falls to below normal levels which are shown to have occurred at all ports some 12 hours before the arrival of the surge peak are a usual phenomenon caused by the strong southerly winds ahead of a depression.

The difference in tidal levels along the east coast of England between that of high water at the highest spring tides and high water at lowest neap tides is of great importance to S.T.W.S. This difference is naturally greatest where the tidal range is greatest, i.e., at Tyne Entrance and Immingham. Thus on 15th October 1962 the predicted height of high water at the two places was only 0.2 ft. below the danger levels. The issue of warnings to those two divisions was consequently almost automatic, and both were most vulnerable to even a small surge at high water that day.

Yet at certain neap tides the height of predicted high water at Tyne Entrance gives a safety margin of $6\frac{1}{2}$ ft. below the danger level, and at Immingham this margin is over 8 ft.

At the southern ports the safety margin is less variable. It is seldom less than 2 ft. at spring tides and not more than about $5\frac{1}{2}$ ft. at neap tides.

In making forecasts of the heights and times at which surge peaks will pass down the east coast many elements have to be considered. Thus, when forecasting for Tyne Entrance it is not possible to base this on the peak at Aberdeen as the forecast for the Tyne must be issued 4 hours before high water there and the surge peak will only pass Aberdeen about 2 hours before it passes Tyne Entrance. To assist in this difficulty arrangements were made in 1962 to obtain observed and predicted hourly tidal heights at Stornoway and it is hoped to make similar arrangements for a gauge at Wick in the spring of 1964. These gauges should provide good long range warnings of surge formations.

Surge forecasts for Immingham, Lowestoft, Harwich and Southend are all based on the size and timing of the surge as it passes places further north. Allowance is made for the local winds and forecast changes in these and for certain local conditions which affect surges at the various ports. Thus very large surges during the rising tide at Southend almost invariably fall abruptly in the last three hours before high water there. This phenomenon is shown on the graph for the surge of 20/21 March 1961.

Allowance must also be made for the barometric height and the forecast changes in this. A drop of 30 mb. of atmospheric pressure will theoretically cause a rise in sea level of one foot; but the time taken for a variation in pressure to affect sea level is not constant.

Certain formulae have been established by which surge heights can be calculated. These are based on a factor of the surge height at a place further north, with additional terms which allow for local wind, barometric heights, and changes therein. These formulae serve as a check, but in the main the S.T.W.S. base their forecasts on past experience assisted by records of the meteorological conditions during periods of past surges. After 10 years for which good tidal and meteorological records have been kept this data is now becoming of some real service.

Recent and Future Developments

In surge forecasting the speed of receipt and the accuracy of data are very important. Forecasts of surge heights must be issued 4 hours in advance, so the more up-to-date the tidal data available the greater the accuracy in forecasting. Errors in the observed tidal heights sent from the various ports, be they due to errors in reading the gauge or errors in transmission, can have very serious effects. Similarly errors in calculated predicted tidal heights give a false impression and affect forecasting. The speed of transmission of warning messages to the local authorities is also of great importance.

In order to reduce data errors and cut out the time lag in the receipt of tidal data arrangements were made early in 1963 for the installation of distant-reading recorders in the offices of the S.T.W.S. from the tide gauges at Aberdeen and Immingham. These recorders give an instantaneous and continuous graphic trace

of the tidal heights at the two ports. They cut out the 30 minutes or so formerly taken in transmission of these heights, and also data errors, as the gauges have height checks incorporated in their mechanism. These two gauges proved so satisfactory that arrangements were made for 5 similar recorders to be installed from tide gauges situated at Wick, Tyne Entrance, Lowestoft, Harwich and Southend. These should all be operational by the time this paper is in print, when S.T.W.S. will be completely self-contained so far as tidal data is concerned.

Delays in transmission of warning messages are not easy to eliminate. Under the old scheme such messages took over 30 minutes in transit, with occasional messages taking up to an hour. They went to as many as 30 addressees at a time and delays occurred in the Central Telegraph Office at night when there is a reduced staff. A revised procedure has now been worked out which eliminates this bottleneck. Messages are sent by Telex to Police H.Q.s who transmit them to the authorities concerned.

The Chances of Another Disastrous Flood

Much research in this matter has been and is still being undertaken by various mathematical and scientific bodies. The problem is most complex because, although there is strong evidence that the sea level in the southern North Sea has, in the past 50 years, been rising at the rate of about one foot per century, this rise may or may not continue. It has also been suggested that the land level is falling in the south but is rising in Scotland.

One mathematical conclusion, to put it in the simplest and most general terms, is that the highest tides in the southern North Sea and Thames Estuary are showing an upward trend. If the mean sea level also continues to rise then the return period for levels similar to those in 1953 is less than 100 years. If the sea level ceases to rise as has occurred in the first half century then the return period is more nearly 150 years.

On the meteorological side it is considered that no significant changes in the frequency or severity of depressions affecting the North Sea have occurred in recent years nor is there any trend of change.

Looked at from the more general angle the hard fact is that there is no fundamental reason why a depression of the type which caused the 1953 flood, or even one more intense, should not occur again. This could happen during a period of high spring tides, and the timing of the passage of the depression could be such that the surge peak coincided with the local high water. Despite our improved sea defences such a coincidence would almost certainly result in a greater degree of flooding than that in 1953. It is hoped that at least this time adequate warnings would result in lives being saved.

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Handling Meteorological Data by Electronic Computer

By E. KNIGHTING, B.Sc.

(Assistant Director (Dynamic Research) in the Meteorological Office)

In the past few years the Meteorological Office has been carrying out experiments in numerical prediction of the prebaratic charts. Such forecasts require very lengthy computations, so lengthy that it would take a man, using an electric desk calculating machine, several years to make one 24 hr. forecast. The Meteorological Office bought a Ferranti Mercury electronic computer, known as METEOR, to make the computations in a reasonable time. METEOR computes so quickly that a 24 hr. forecast takes less than one hour. The computations are based upon analysed synoptic charts at 1000 mb. (near the surface), 500 mb. (about 18,000 ft.) and 200 mb. (about 40,000 ft.). The data from these charts which are necessary to start the computation have to be put into a form suitable for entry into METEOR, which accepts 5 hole punched paper tape. At first the required data were read from the analysed charts and then hand punched paper tape was prepared but it soon became evident that this method was too slow to be of use when forecasts were to

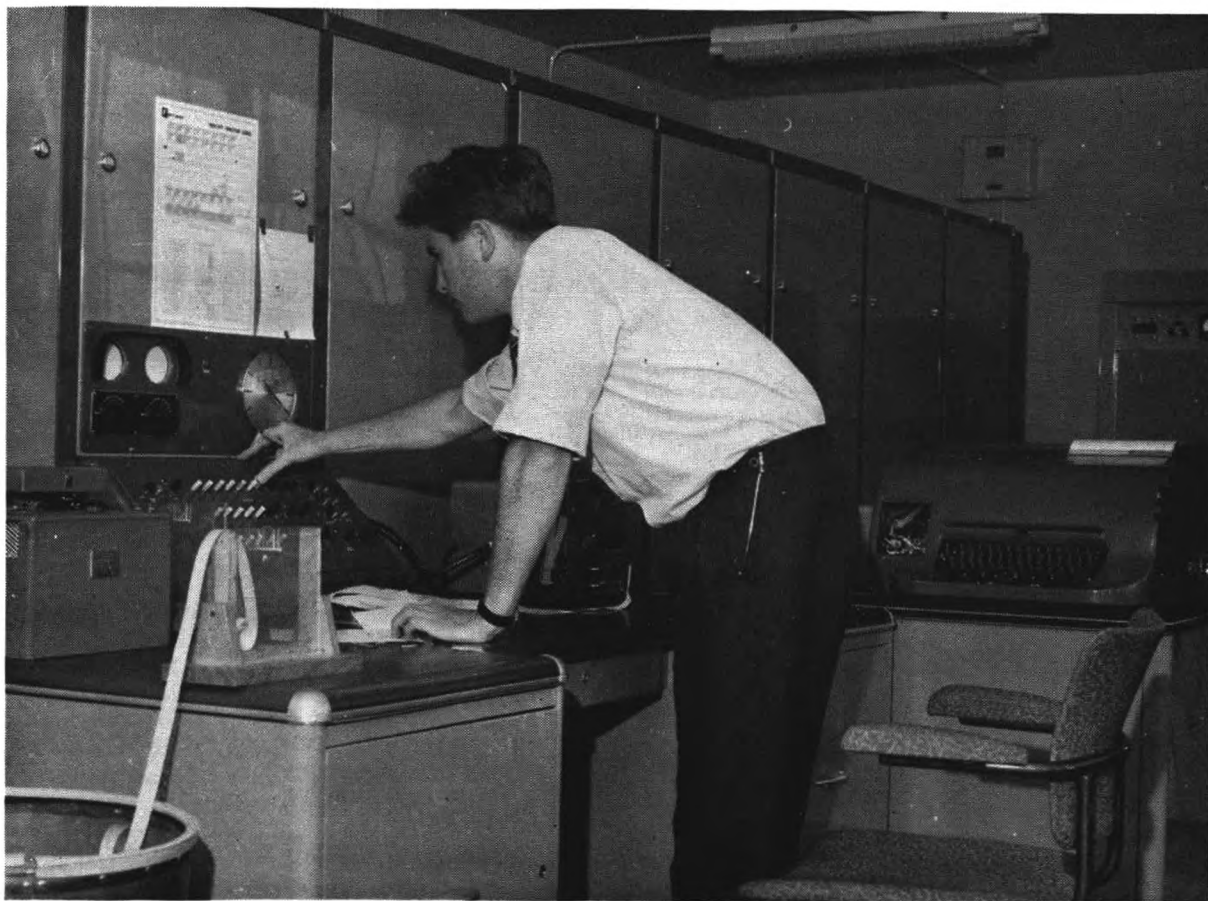
be produced on an operational basis. Most of the meteorological reports which, when plotted, form the basis of the analysis are received by teleprinter at Bracknell and are already in the form of punched paper tape and so are suitable for putting information into METEOR. It was, therefore, natural to try to evolve a system by which the computer took the teleprinted data as received, extracted from it precisely the reports required to analyse the synoptic charts, carried out the analysis and finally used this analysis to obtain the data required to start the computations. It is the first of these tasks, the extraction by the computer of the meteorological observations from the teleprinter punched tape, that is considered here.

First, the size of the problem has to be examined. In order to ensure an adequate amount of meteorological information for the purpose of forecasting for 24 or 30 hours it is necessary to read in upward of 750,000 numbers or of 150,000 five figure groups. Some of this information is rejected by the computer as not being of any use, perhaps because it is not information containing meteorological observations for the right time or the right kind. Broadly what is required is as many meteorological observations for midnight and six o'clock as are available from all the upper air observing stations, a selection of land surface observing stations and *all* the ship reports from 1800 GMT to 0600 GMT, covering an area from the Rockies to east of Moscow. Currently the type of forecast made is being changed and the information will be required for the whole of the Northern Hemisphere. The computer is told how to (or 'programmed' to) recognise the type of observation which is required, how to tell land observations from sea observations, and surface observations from upper air observations.

All observations are subject to error, either in observing, transmission or reception. Some of the errors are due to mechanical failure, such as an operator correctly pressing a teleprinter key but an incorrect number being printed or punched. On land lines such mechanical failures are rare, perhaps one in ten thousand or more; for radio-teleprinters there are rather more errors of this kind. Since most of the land based observations are transmitted by teleprinter the number of transmission errors is small: there still remain observational errors and errors made in writing down the observations and in the actual process of punching or teleprinting. The geographical distribution of land observing stations is such that it is comparatively easy to find an error by comparison with nearby observations made at the same time. But it is a very different story as regards ship observations.

The number of ship observations is much smaller than that of land observations and moreover the geographical distribution of ships' reports at any particular synoptic hour is not as evenly spaced as the reports made by land stations. Therefore every ship report is of importance and this importance is recognised by preparing a special punched tape which contains only ships' observations for entry into the computer. Unfortunately the meteorological reports from ships have to be transmitted by w/t and, due to atmospheric conditions, the importance of ships' reports is matched by the number of errors in the messages which finally reaches the computer. Very special steps have to be taken to check each report as far as possible.

The code in which ships' observations (or any observations) are reported was designed for use by human beings, so that it is easy to remember and easy for the human eye to recognise when written or printed; it is not a code which is particularly suitable for use in computers, which lack the intelligence of a human being. For example, a meteorologist could probably interpret a pressure reported as 491 as 941 mb., the error having been made in transcription, or would recognise that a temperature reported as 52 had been expressed in the Fahrenheit scale. The computer does not have a memory like that of man and does not rely on experience for it does not have any; every problem that it meets it has to solve afresh. Since the computer has some difficulty with interpreting the correctly coded message, it has even more difficulty when some variation is used which perhaps it cannot interpret properly and the information within the message is then lost. For example, the pressure may mistakenly be reported in mb., instead of mb. and tenths, so that



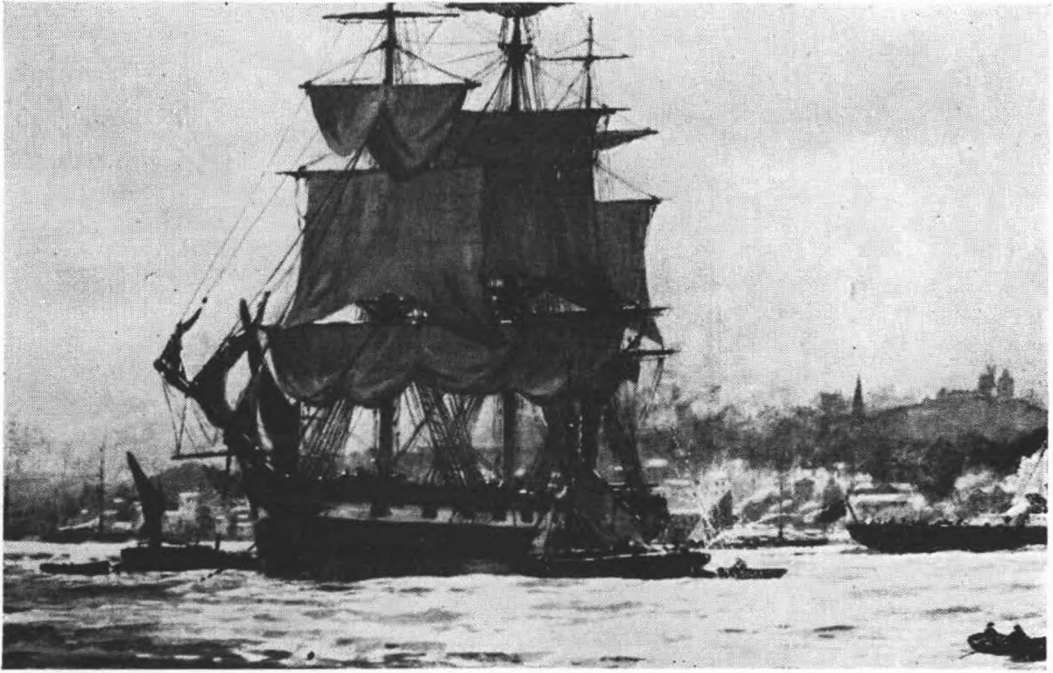
Crown copyright reserved

METEOR in operation.

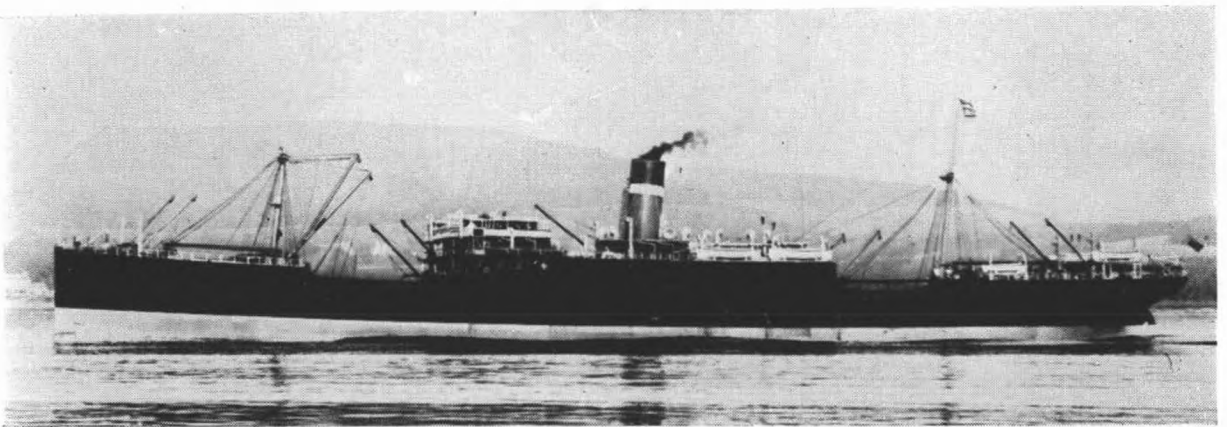


Presentation of barographs, 10th December 1963 (see page 96); l. to r.: Captain F. Lewis, Captain W. Hine, Dr. A. C. Best, Captain E. C. Hicks.

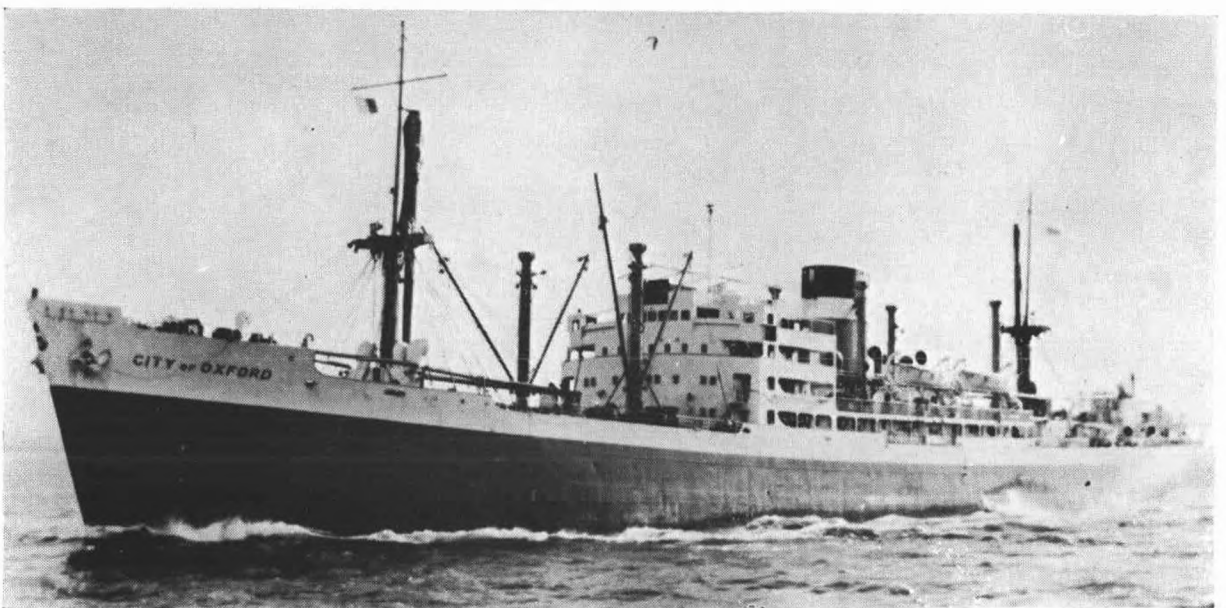
(facing page 85)



City of Benares

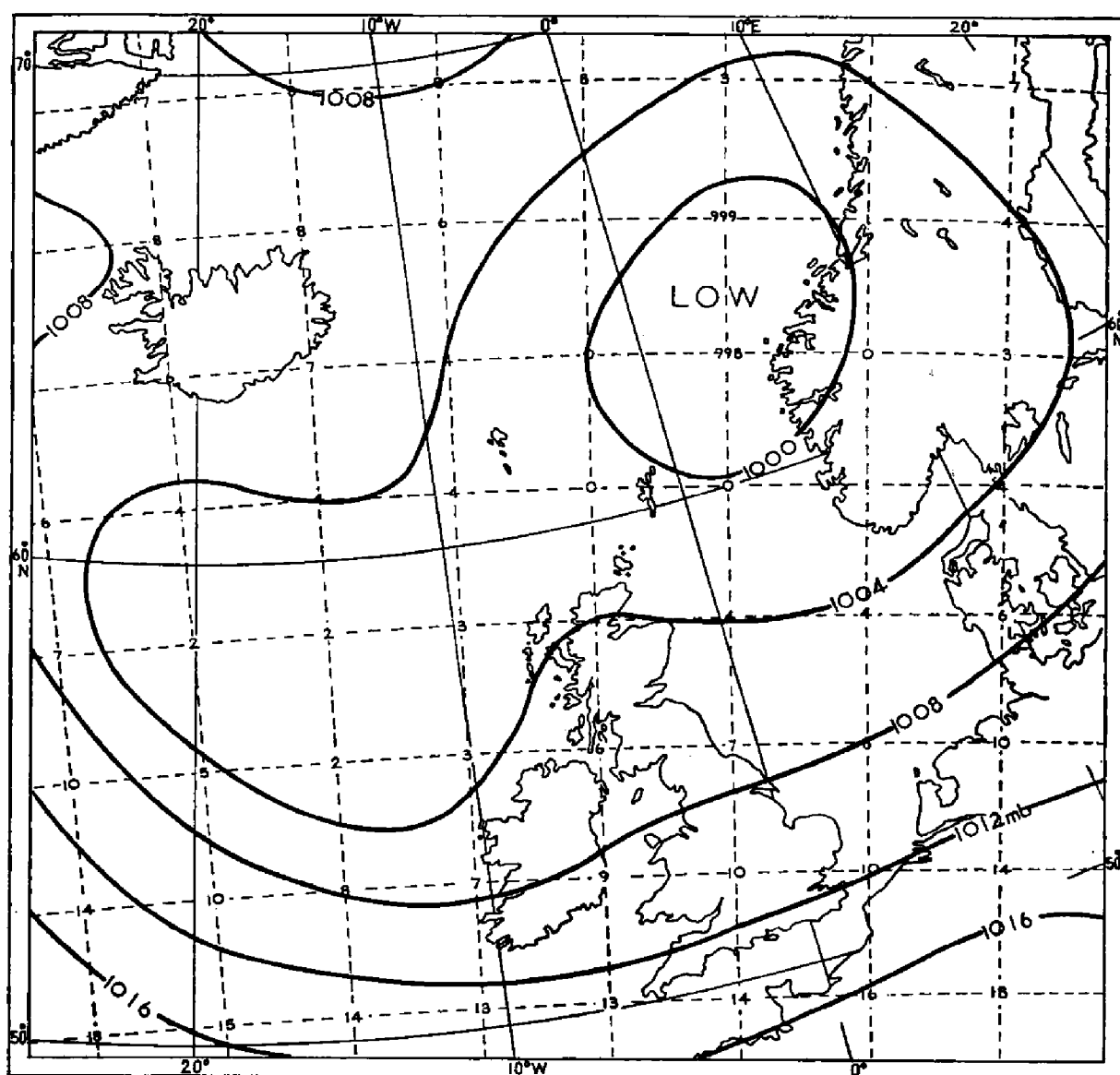


City of Calcutta



City of Oxford

Observing Ships of the City Line (see page 90).



Section of a surface 30 hr. forecast chart computed by METEOR. (Forecast for 0600 GMT, 10th August 1963; time of origin 0001 GMT, 9th August 1963.)

0	008	005	001	999	999	004	011	013	013	011	008	004	006	009	009	007	008	010	010	009	007	008	011	0
0	006	006	003	000	998	001	008	012	012	009	007	007	008	008	005	003	004	007	007	007	007	008	012	0
0	008	007	005	003	001	001	008	013	012	009	008	008	008	006	001	999	001	004	005	005	006	008	011	0
0	009	009	008	007	006	005	009	014	013	010	007	006	007	004	000	998	000	003	005	006	008	009	010	0
0	011	011	011	011	011	010	012	015	015	011	006	004	004	004	002	000	001	004	007	009	010	010	010	0
0	013	014	015	015	016	016	016	017	017	013	007	002	002	003	004	004	004	006	009	011	011	010	010	0
0	014	016	018	020	020	020	020	020	020	016	010	005	002	003	006	007	008	010	011	012	011	010	010	0
0	014	018	020	021	022	023	023	022	019	014	010	008	007	009	010	012	014	014	013	010	010	010	010	0
0	015	019	020	020	022	023	023	023	022	020	018	015	014	013	013	014	016	018	017	013	010	010	011	0
0	018	019	019	020	021	022	022	021	021	020	020	019	019	019	018	019	020	021	018	014	011	011	012	0

Part of the output from METEOR. The part in bold type is shown drawn up above.

1024.0 is encoded as 024 and not as 240; the computer will interpret this as a pressure of 1002.4 mb. It is always a pity to lose information that has been very carefully obtained by observation.

Consider now the 'life history', after it reaches Bracknell, of a report of meteorological observations made on a ship; it differs somewhat from the life history of any other report in the way it is handled both in communication procedure and in its treatment within the computer. As has already been mentioned, reports from ships

are sufficiently valuable to warrant being punched on a special 'ships' tape' at Bracknell particularly for use in the computer. This tape bears the teleprinted message as received from, say, Portishead, and of course is subject to all the errors of observation and transmission that are possible. The particular report is read into the computer and the first check that is made is that the report refers to the correct day of the week and the time digits are noted. Then the computer searches for the call-sign of the ship. It is, of course, most important that the call-sign be attached to every message; without it there can be no check on the position. When the call-sign has been recognised the computer searches within its memory for the last report with the same call-sign, and checks that the new reported position conforms with the previous position and the speed and direction of the ship. If the positions do not check then the whole report is set aside and will shortly be printed out by the computer for examination. If the positions do check then the reported pressure and tendency are examined and a check is made that the reported pressure agrees within reasonable limits with the previous pressure and the tendency. If the previous report is more than six hours old, or there is no previous report, this check cannot be made. If the check fails the whole report is set aside for printing out. The reported wind is also examined to see that it is reasonable, for example that the reported direction is possible, and again if there is any doubt the report is put aside to be printed out. There are now two lists of ship reports, those that have passed all tests and those which are in doubt for one reason or another. Both these lists are printed out by the computer and the second list may now be examined to see what is wrong. As an example of the size of these two lists, on 27th September 1963 there were 43 reports which passed the tests and 4 which failed.

The pressure and temperature of each ship is used to find the height of the 1000 mb. surface and this surface is now analysed. Over oceanic areas the analysis is completely dependent upon meteorological reports from ships and since there are comparatively few any undetected error may lead to a completely false analysis. For example, if a ship is several hundred miles from its nearest reporting neighbour an error of 10 mb. in the reported pressure as received at Bracknell will be undetected because it is a possible pressure and an analysis which is possible will be constructed in that area. In order to avoid some possible errors of this kind the analysis is made using not only the meteorological reports from ships but also the expected pressure field as found by a previous forecast. When this analysis has been made the pressure and wind as reported are compared with those implied by the analysis and if there is a wide discrepancy, of more than 12 mb. or 35 knots, the report is printed out for examination. On 27th September 1963 for example, there was one report which had large discrepancies on both wind and pressure, probably because the reported position which reached Bracknell was in error. If the ship's report has passed all the tests which have been made it is retained for a second or final analysis. Those which have failed the test have been printed out and are now examined and if possible corrected, the analysis is then carried out.

The most common errors seem to be in the reported position and pressure and these two pieces of information are often the most vital. Of course the position must be correctly known if the report is to be of any value at all and the error that creeps in somewhere between the originator and Bracknell is usually one of 10° in latitude or longitude; there may be 1° errors but the tests applied are not stringent enough to detect them. Similarly pressure errors of 10 mb. are probably the most common. Great difficulty arises in devising the tests, especially as regards pressure. When the reported pressure differs very greatly from that expected extreme caution must be used to ensure that the report is not rejected out of hand, for frequently the report is correct and is the first indication of some atmospheric system which has not previously appeared on the chart or of the change in direction of movement of a known atmospheric system. Every report is weighed very carefully before being rejected and the benefit of any doubt is given to the report, i.e. a report is innocent until it is proved guilty and it does not have to prove its innocence.

There is little doubt that in the future more and more meteorological data will be handled by electronic computers, and that somehow the errors which creep into reports must be decreased. Vigilance at every stage of a report's life history will be even more essential than now. Perhaps this will be more necessary for ships' reports than for others because they play so vital a role in our knowledge of what is going on.

551.509.21:654.19:656.6

On the Recording of the Weather Bulletins for Shipping, Broadcast by the B.B.C. on 1500 m. in the Light Programme

BY LT-CDR. L. B. PHILPOTT, D.S.C., R.D., R.N.R.
(Nautical Officer, Marine Division, Meteorological Office)

In the article on the Coastal Sea Areas published in the January 1964 number of *The Marine Observer*, it was mentioned that one of the difficulties which the shipmaster or officer experienced in getting full value from the weather bulletins broadcast on 1500 m. in the B.B.C. Light Programme was the speed at which they are read.

This is a perennial problem, rather akin to that of trying to get a quart into a pint pot, and has many times been discussed at the periodical conferences of Port Meteorological Officers. The plain fact is that the B.B.C. can only allocate a certain time to weather bulletins for shipping and that time is quite incapable of being extended. Our aim is, of course, to get as much information as possible into the time allocated but, though alternative modes of presentation have often been suggested and discussed, it has been found that there is literally no way of shortening any of these bulletins without sacrificing some of the material itself. So far from them being shortened and thus read more slowly, additions have been gradually made, almost invariably at the request of the coastwise mariner; for example, the reporting of pressures from the *Dowsing*, *Galloper* and *Royal Sovereign* early in 1963 and, more recently, the reporting of barometric tendency from *Galloper*. Each of these additions means just a little extra squeezing of the other matter in the bulletin and though it may not be impossible later on to include pressure tendencies also from *Dowsing* and *Royal Sovereign*, the limit of what can be read in the allotted time has now substantially been reached. Fortunately the speed of reading is often helped by the fact that two or more sea areas can be bracketed together as having the same forecast (it will have been noted that such an area is only tied to one which comes later on in the bulletin, never to one which has already been read), but if the day ever comes when each one of the 28 coastal sea areas has its own individual forecast, then indeed will the announcer be hard pressed to get through the material in the time available. On such an unhappy day it will almost certainly be necessary to omit some of the actuals, i.e. "weather reports from coastal stations at . . . GMT".

In view of the fact, then, that little or nothing can be done to adjust the announcer's speed agreeably to that of the user's pencil, it is obvious that some shortened method of taking down is desirable.

At the outset, may the writer apologise to the numerous coastwise shipmasters and officers to whom the taking down of these bulletins is a routine and who will doubtless have their own methods. The following hints are intended rather for the foreign-going officer who spends little time in home waters and may consequently never get really familiar with the bulletins. It is thought that such officers, and perhaps some of the coastwise ones also, may be interested in knowing how the writer takes down these bulletins at home.

The first essential is adequate preparation. It goes without saying that it is no use starting with a pencil and a virgin sheet of paper, for dictation speed is quite impossible.

SHIPPING FORECAST (B.B.C. 1500m.) AT GMT 1964

GALE WARNINGS
FOR AREAS

GENERAL SYNOPSIS:-



FORECAST FOR SEA AREAS FOR NEXT 24HRS.:-

	AREA	GALE ?	WIND		WEATHER	VISIBILITY	REMARKS
			FORECAST	BECOMING			
1	VIKING						
2	FORTIES						
3	CROMARTY						
4	FORTH						
5	TYNE						
6	DOGGER						
7	FISHER						
8	GERMAN BIGHT						
9	HUMBER						
10	THAMES						
11	SMITH'S KNOLL	///					
12	DOVER						
13	WIGHT						
14	PORTLAND						
15	PLYMOUTH						
16	BISCAY						
17	FINISTERRE						
18	SOLE						
19	LUNDY						
20	IRISH SEA						
21	FASTNET						
22	SHANNON						
23	ROCKALL						
24	MALIN						
25	HEBRIDES						
26	MINCHES	///					
27	FAIR ISLE						
28	BAILEY						
29	FAEROES						
30	S.E. ICELAND						

REPORTS FROM COASTAL STATIONS AT GMT:-

STATION	WIND		WEATHER	VIS.	BARO.	TENDENCY
	DIR.	FORCE				
WICK						
BELL ROCK						
DOWSING						
GALLOWER						
R. SOVEREIGN						
PORTLAND BILL						
SCILLY						
VALENTIA						
RONALDS WAY						
PRESTWICK						
TIREE						

Suggested form on which the weather bulletins for shipping can be taken down.

Opposite is a reproduction of the form which the writer uses. Reduced to the size of a page of this journal, it would be of little use, but if drawn up on the back of a cancelled chart (as the writer has it) it will give ample room to make all the entries. It is ruled up in black ink and the entries made in soft pencil. Thus its life can be equal to that of an ordinary navigational chart at least.

Gale Warnings

The bulletin always opens with the gale warnings in force and these are given in the order that the areas are listed in the forecast. Because of the varying number of areas with warnings in force (in winter time ten or fifteen are not uncommon) it is often impossible to write these down. For this reason, the column headed GALE? is provided; a tick is placed against the area carrying a warning. The names can be entered in the top panel later.

General Synopsis

The general synopsis may be of almost any length and is almost invariably the most difficult part to get down. It will be seen that the writer uses a rough map to help with this, extending from about 30°W to 20°E. The general synopsis in the 2400 bulletin of 31st December 1963 read "a weak ridge just to the west of Ireland and a weak trough from Norway to Scotland are becoming absorbed in the circulation of a large depression of 950 millibars now about 500 miles SW of Iceland. The depression centre will continue moving slowly NE while the associated frontal system will cross western sea areas during tonight and reach Ireland by evening". That could all fairly easily be roughed out on a map; the word TROUGH could be written to join Norway and Scotland, the word RIDGE could be written from S to N just west of Ireland, and figures 950 enclosed within a circle with an arrow pointing NE-wards from it could be written on the left-hand edge of the map.

Forecasts for Coastal Sea Areas

The writer has found it convenient to number these areas on the form in the order in which the forecasts are given. The numbers have no real significance and are given merely because when areas are bracketed together it is easier to refer to them by numbers rather than by name. For example: if the forecast for Tyne was to be the same as for Humber, one would just write 9 (i.e. Humber) against Tyne. Similarly, if Portland and Plymouth were the same as Lundy, one could just bracket them together and write a 19 (i.e. Lundy) against the bracket.

The shaded squares against Smith's Knoll and Minches are a reminder that these two areas are not always named; Smith's Knoll figures only during the East Anglian Herring Fishing Season (1st October to about the end of November) and Minches is given only in the 1340 and 2400 broadcasts from Mondays to Fridays. The reminder was found necessary because, when pressed, it is all too easy to write the Dover forecast against Smith's Knoll during the ten months when the latter is not included.

The filling in of the appropriate columns is self evident. Winds are always given as a true direction in points of the compass followed by a Beaufort force and the forecast wind is very often supplemented by a statement of backing, veering, strengthening etc. This entry is allowed for in the column headed BECOMING.

No form of meteorological shorthand for recording weather conditions can beat the well tried Beaufort notation which, whilst its use in the meteorological logbook was discontinued some years ago, has been retained in the *Marine Observers' Handbook* (pages 43 and 44) against just such an eventuality as this. There should be no difficulty in recording the expected weather in the appropriate column in this way. Sometimes the weather is given in such terms as "rain spreading from the west"; this could be recorded by placing r in the left half of the compartment and arrowing it to the right. Similarly "heavy rain in the south-east" would call for an R in the bottom right-hand corner.

Visibility in this part of the broadcast is always expressed in plain language, e.g. good, moderate, poor etc.; there can be no difficulty about this.

Weather Reports From Coastal Stations

The time of these is always given and is usually 2 hours before the broadcast. No difficulty should be experienced with noting them down. Once again, the wind is given as a true direction in compass points and Beaufort force; Beaufort notation should be used for weather; visibility comes in yards or miles as appropriate and should be written as read; pressures could also be written as read or perhaps, for the sake of speed, the hundreds of millibars could be omitted as in the meteorological logbook. The tendency could be shown by a line, horizontal if the glass is steady or with a slope agreeable to its speed of rise or fall.

The above method does not claim to be in any way superior to any other method which may be used; some shipmasters may perhaps prefer to use an enlarged map of the sea areas, as published on page 48 of the Ship's Code and Decode Book and to enter the forecasts and observations against the position to which they refer. This method gives perhaps a better picture of the forecast, but on the other hand it requires a greater familiarity with the positions of the named areas and coastal stations.

There must be dozens of different ways of setting out this bulletin; the above is merely the one which suits the writer.

The City Line

In continuation of our pictorial series of ships of one ownership covering a century of voluntary observing for us, we publish opposite page 85 pictures of three observing ships belonging to the City Line, originally known as Messrs. G. Smith & Sons of Glasgow but now forming part of the Ellerman group. This company is one of the oldest in our registers for it was as long ago as 29th October 1856 that our agent in Glasgow supplied a set of instruments to their *City of Benares*. The barometer supplied to her was numbered B.T. No. 1 and was our first Kew pattern marine barometer. This instrument saw service in many other ships until 1910 when it came ashore to the Meteorological Office Museum, being transferred to the National Maritime Museum at Greenwich in 1954.

This ship is the subject of our first picture, a reproduction of an illustration held by the company, as she lay off Gravesend outward bound in 1857. She was a wooden full-rigged ship of 751 gross tons, built in Glasgow in 1853. Readers will notice the painted gun ports, a survival from the days of the East India Company whose ships were armed and had held a monopoly of the Indian trade until some thirty years previously.

City of Benares's first meteorological logbook was received here on 30th July 1857 and covered a voyage to Calcutta. We received several more logbooks from her, mostly covering the same run, until 1871 when she disappeared from our registers.

Our second picture is of the *City of Calcutta*. She was a steel steamer of 7,379 gross tons built in 1903 by Workman, Clark and Co. of Belfast. Her first meteorological logbook was received here on 22nd March 1911 and thereafter she was a regular observer until 24th April 1914 when we received her last records.

Our third picture is of the company's latest observing ship. She is the *City of Oxford*, of 7,593 gross tons, built by John Brown and Co. Ltd. of Clydebank in 1948. Under the command of Captain W. S. Doidge, she joined the voluntary observing fleet in July 1960.

We take this opportunity of recording our gratitude to the masters and officers of the City Line who have been voluntarily observing for us for the past 107 years. The company's name has seldom been absent from our registers; in the first ten years of our life, up to 1863, we had received meteorological logbooks from eight of their ships, today four of their fleet of eight ships are observing for us.

We are indebted to the management also for the loan of the pictures which we have reproduced.

L. B. P.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM OCTOBER TO DECEMBER 1963

OCTOBER

Relevant weather factors. Throughout the month pressure was low over the Russian side of the Polar Basin and from the Kara Sea to southern Greenland while another active trough covered the Davis Strait. This was the result of the continuous passage of depressions from the western Atlantic; there was similar activity in the Davis Strait. Pressure was high on the Canadian side of the Polar Basin. Freezing went on most actively over the Canadian side of the Arctic. Elsewhere the seasonal developments of ice were generally below normal.

Canadian Arctic Archipelago including Baffin Bay and Hudson Bay and Strait. The extent and thickness of ice in these areas was well below normal except over the east of the Archipelago where the season was about a month ahead of normal with ice thicknesses of approximately one foot. The amount of snow was well below normal generally. In Foxe Basin the extent of ice was well above average but not the thickness. In the latter half of the month new ice began to form over Canadian Arctic waters generally, but Hudson Bay south of 62°N had little or no ice. A striking anomaly was the lack of pack-ice in the Beaufort Sea.

The coast of Greenland was almost clear of fast and pack-ice south of Kane Basin, i.e. well below normal and in contrast to the heavy season over the adjacent part of the Canadian Arctic.

The iceberg population over the whole area appeared below normal except near the glaciers of Disko Island where individual land stations reported more than 200 icebergs at a single sighting.

Davis Strait and Labrador Sea. A mass of heavy pack-ice extending eastward for several degrees of longitude persisted around the south-east of Baffin Island extending southward to Cape Chidley and blocking the entrance to Hudson Strait. Elsewhere the area was free of pack-ice. Small numbers of icebergs moved southwards along the Labrador coast and northwards off South-west Greenland where individual land stations observed between one and 15 icebergs. Sea temperatures off South-west Greenland were relatively high at approximately 5°C.

Belle Isle Strait, Great Bank and East Newfoundland Coast. Warm air from eastern Canada flowed over this area during most of the month. The mean gradient wind and the distribution of sea surface temperatures suggest that the Labrador current was probably weaker than normal. There was, therefore, no pack-ice and isolated icebergs and growlers only off the eastern entrance to the Strait. Elsewhere there was little or no ice. These conditions continued on with little change into November and December.

Gulf of St. Lawrence, River St. Lawrence and Great Lakes. Mainly ice free. These conditions continued on into November.

Greenland Sea. Over most of the month this area experienced a north-easterly gradient wind and was one of the coldest in the northern hemisphere. There appeared to be little movement in the polar and arctic pack in the Polar Basin to the north, but sea temperatures adjacent to the ice and west of Spitzbergen were above normal. Temperatures of 8°C were reported south of Spitzbergen.

Fast-ice off Greenland was in excess of normal in area and thickness but normal in the south towards Scoresby Sound. The gradient wind caused the arctic pack to consolidate against the Greenland coast but it also tended to increase the flow of the East Greenland Current and hence the southward drift of the polar pack. There was, as a result, a large accumulation of pack between Greenland and North-west Iceland. The number of icebergs released from the glaciers and moving southwards decreased. At the end of the month individual land stations reported 6 to 15 icebergs moving southwards. Isolated bergs left the pack-ice and moved towards North-west Iceland.

The west coast of Spitzbergen and Bear Island were ice free apart from the north-west of Spitzbergen at the limit of the arctic and polar pack.

Denmark Strait. Much warm Atlantic surface water filled the Strait but Arctic water moved southwards, wind driven, in large tongues from the latitude of the Arctic Circle. A narrow belt of very open polar pack was moving all along the Greenland coast, almost to Cape Farewell. This southerly penetration was in excess of normal. There were large numbers of icebergs in this section of the pack, individual land stations reporting up to a hundred icebergs. An unusual but by no means isolated feature of this period is that the icebergs instead of moving round to the west coast of Greenland drifted extensively south-eastwards from Cape Farewell into the Atlantic where sea surface temperatures were as high as 7 to 8°C. The extreme south-easterly penetration of the icebergs was as far south as 56½°N 38°W (about 300 miles SSE of Cape Farewell), not far off the Great Circle track from Cape Wrath to Belle Isle.

Barents Sea. Over most of the period a trough of low pressure extending from the south-west covered the area as the result of a continuous influx of depressions. Sea temperatures were relatively high in the south (7°C being reported) but arctic surface water was extending steadily southwards, to some extent wind driven, and making great inroads into the warm

water. There was no ice against the Russian coast in the south-east and in the White Sea. The extent of polar and arctic pack in the north was about normal.

Baltic Sea. Sea surface temperatures were 1 to 2°C above normal. There was no ice reported.

NOVEMBER

Relevant weather factors. At the beginning of November pressure was abnormally high over Greenland and across the Polar Basin to the Bering Sea causing southerly gradient winds over Eastern Canada. This situation gradually returned to a more normal circulation of northerly gradient winds by the end of the month. Intensive cooling continued off north-east Greenland but the Russian Arctic cooled at a more rapid rate than the Canadian Arctic.

Canadian Arctic Archipelago including Baffin Bay and Hudson Bay and Strait. There was a very great increase in the mass of ice over the Archipelago and adjacent Basin. Thicknesses of over 3 ft. were reported. There was a very slight increase in the snow cover. The area of moderate pack-ice in Baffin Bay increased and was about normal, but the extent of the fast and pack-ice off the West Greenland coast was less than normal, and there was very little change in the iceberg population over Baffin Bay as a whole.

The amount of freezing in Foxe Basin and Hudson Strait was less than average. Foxe Basin had less than normal fast-ice over shallow water but was covered elsewhere by hummocked, very close, pack-ice. Widespread new ice, consolidated locally to pack-ice, was forming over the margins of Hudson Bay and Hudson Strait. Pack-ice from Davis Strait drifted along the northern shores of Hudson Strait.

The Beaufort Sea had become covered with very close pack-ice but the concentration and thickness of the ice remained below normal.

Davis Strait and Labrador Sea. The area of heavy and very close pack-ice off the south-east of Baffin Island had not greatly increased but it had become consolidated. Thicknesses were of the order of 1½ ft.

The iceberg population off South-west Greenland and along the Labrador coast continued well below normal. These conditions continued on into December with normal seasonal developments.

Greenland Sea. The north-easterly gradient wind continued to predominate. There appeared to be widespread mixing of Arctic surface water with Gulf Stream water between eastern Iceland and Spitzbergen. One tongue of cold water penetrated south-eastwards from north-east of Iceland almost to the Norwegian coast off Bergen.

The extent of the fast-ice off Eastern Greenland increased but the area of polar pack decreased and was below normal. The accumulation of pack off Greenland, north-west of Iceland, dispersed.

Off south-western Spitzbergen there was new ice. Bear Island was ice free.

The Norwegian steamer *Jacob Kjode* passed through an icebelt within a day's steaming of Ny Aalsund (Spitzbergen).

Isolated pack-ice formed in the coastal waters of North-west Iceland.

There appeared to be no significant changes in the iceberg population anywhere.

Denmark Strait. There was a general increase in the extent of the area of close polar pack all along the Greenland coast which moved round Cape Farewell to Julianehaab where it tended to leave the coast and disperse. There were extensive shore leads between the pack and the east coast of Greenland.

Individual land stations continued to report up to a hundred icebergs moving south-westwards within the pack off Greenland. Small amounts of pack-ice were seen off Reykjavik.

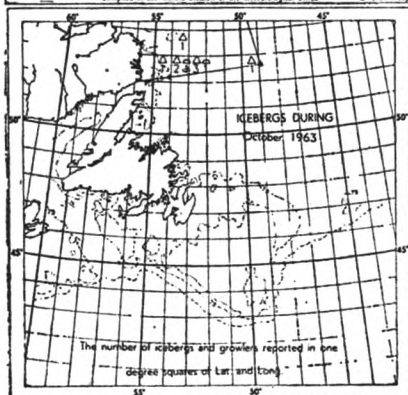
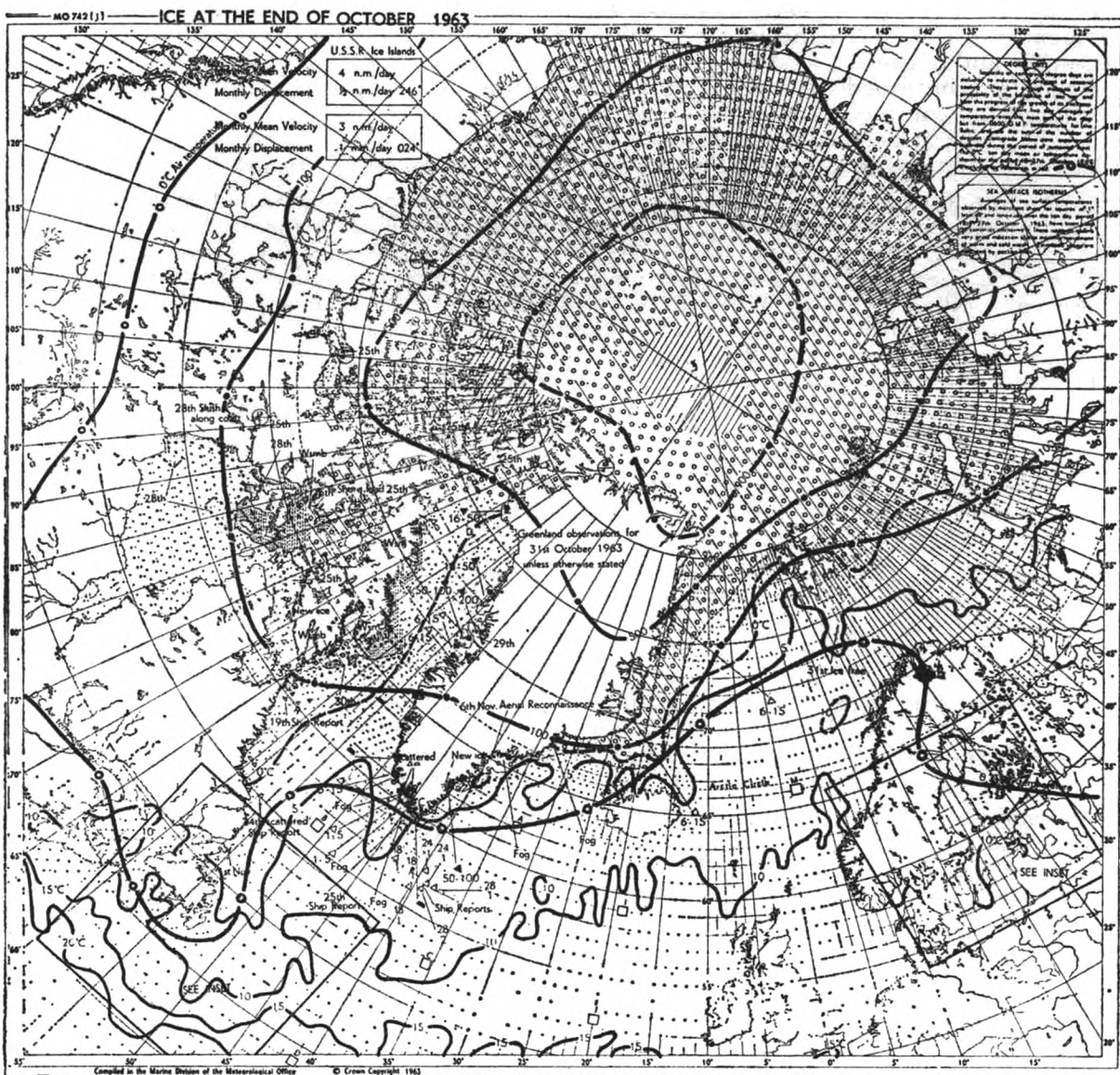
Barents Sea. The persistent north-easterly gradient wind continued to cause surface Arctic water to make large inroads into the Atlantic water to the south and there was associated with this, a general southward advancement of polar and arctic pack between Spitzbergen and Novaya Zemlya becoming slightly in excess of normal in extent. The extent of the ice along the Russian coast in the south-east and over the White Sea was below normal, but new ice was reported over shallow water.

Baltic Sea. New ice formed in the northern part of the Bay of Bothnia and in the extreme east of the Gulf of Finland. There were isolated patches of pack-ice generally north of 57°N but the quantity of ice continued well below normal. These conditions continued on into December but with thicknesses increasing to over a foot in the north of the Gulf of Bothnia but to less than a foot in the east of the Gulf of Finland.

DECEMBER

Relevant weather factors. The predominating feature of the circulation was high pressure from north-east Greenland to western Europe with low pressure south of Greenland and over the Russian side of the Arctic. The rate of cooling over the Canadian Arctic decreased while the Kara and Barents Seas became colder as Arctic air flowed southwards from the Polar Basin.

A striking feature was an influx of warm water into the Norwegian and Greenland Seas and the southern Barents Sea.



Open water Lead Polynya New or degenerate ice Very open pack-ice Open pack-ice Close or very close pack-ice Land-fast or continuous field ice (10/10 (no open water)) Ridged ice Rafted ice Puddled ice	Hummocked ice The symbols for hummocked and ridged ice etc. are superimposed on those giving concentration Extreme southern or eastern iceberg sighting Ice depths in centimetres Snow depths in centimetres Y Young ice (2"-6" thick) W Winter ice (6"-61" thick) P Polar ice (>61" thick) A suffix to YWP indicates the predominating size of ice floes s small (11-220 yd.) m medium (220-880 yd.) b big (1-5 mi.) v vast (>5 miles)	c ice cake (<11 yd.) Known boundary Radar boundary Assumed boundary Limit of visibility or observed data Undercast Isopleths of degree days Max. limit of all known ice Max. limit of close pack ice Min. limit of close pack ice Few bergs (<20) Many bergs (>20) Few growlers (<100) Many growlers (>100)	Radar target (probable ice) Position of reporting station Against iceberg, growler or radar target symbols the date of observation may be put above and the number observed below Estimated general iceberg track. Very approximate rate of drift may be entered. Observed track of individual iceberg approximate daily drift is entered in nautical miles beside arrow shaft Note: The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated.
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- o — Air temperature: 0°C isotherm (mean for 18th–27th August).
- . — Air temperature: negative degree days, $^{\circ}\text{C}$. (See footnote to Table 2 on page 95.)
- — — Sea temperature, $^{\circ}\text{C}$, for 18th–27th August. These isopleths give an indication of the monthly movement of warm and cold water.
- — — Sea temperature, as above, but only estimated values.

Note. The notes in this article are based on information plotted on ice charts each month, similar to the map above, but on a much larger scale (39 in. $\times$ 27 in.). They are available at the price of reproduction on application to the Director-General, Meteorological Office (M.O.1), London Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency.

No ice was reported from Baltic Sea stations.

Canadian Arctic Archipelago including Baffin Bay and Hudson Bay and Strait. Air flowed frequently off the Greenland icecap which tended, early in the month, to delay the formation of fast-ice and to cause a westward drift of pack-ice off the west coast of Greenland.

Arctic air continued to flow over most of Northern Canada and Baffin Bay and seasonal developments continued somewhat ahead of normal.

Table 3 gives observed thicknesses of ice and snow cover at the end of December for a selection of stations in Canada. These were generally in excess of normal.

Gulf of St. Lawrence, River St. Lawrence and Great Lakes. The seasonal developments of ice continued generally below normal as a result of atmospheric flow mainly from Eastern and Central Canada. The shipping route to Quebec from the Cabot Strait remained open with perhaps the need of slight assistance towards the end of the month in the estuary. It also appeared possible to get to Three Rivers and Montreal also with perhaps slight assistance throughout the month. The amount of ice over the Great Lakes was not great but there were navigational difficulties in shallow water.

On December 2nd Chicago and Buffalo were reported closed to shipping but on the same date 15 ships were reported in the St. Lawrence Seaway. Detroit closed on December 6th but on December 16th six ships were still loading grain at Port Arthur and it was expected to continue work beyond 19th December. However, in the latter half of December, ships had to be released from the ice in the shallow water of the western end of Lake Erie, in Detroit River and in Lake St. Clair. The last steamer to leave the St. Lawrence Seaway in 1963 was the *Flying Independent* on 10th December.

Greenland Sea. The rate of flow of polar pack increased all along the East Greenland coast to 65°N and there appeared to be (from sea surface temperatures) a large influx of Atlantic water into the Norwegian and Greenland Seas adjacent to the pack. The extent of the polar pack off Greenland north of the Arctic Circle decreased but it again accumulated off the coast north-west of Iceland.

There was little change in the ice situation off West Spitzbergen where the amount of ice in the fjords of the south-west of Spitzbergen continued less than normal, i.e. there was only slush. The southern limit of the arctic pack, adjacent to the north-west of Spitzbergen, was, however, south of its normal. There was little change in the iceberg population generally.

Denmark Strait. There was a large accumulation of polar pack in the north of the Strait, but normal amounts moved southwards along the Greenland coast penetrating round to the west coast of Greenland but then dispersing before moving further north. The number of icebergs moving along the Greenland coast within the pack decreased materially suggesting that a large (unobserved) release of icebergs further north had come to an end.

Barents Sea. A large amount of heavy open pack-ice was reported in Petchora Bay and there was open pack in the White Sea with fast-ice in rivers and inlets along the Russian coast generally.

Table 1. Icebergs sighted by merchant ships in the North Atlantic
(This does not include growlers or radar targets)

LIMITS OF LATITUDE AND LONGITUDE		DEGREES NORTH AND WEST					
		58	56	54	52	50	48
Number of bergs reported south of limit	OCTOBER	7	5	5	0	0	0
	NOVEMBER	> 9	> 9	> 9	> 6	0	0
	DECEMBER	0	0	0	0	0	0
	Total	> 16	> 14	> 14	> 6	0	0
Number of bergs reported east of limit	OCTOBER	7	7	6	4	1	0
	NOVEMBER	> 9	> 9	> 4	0	0	0
	DECEMBER	0	0	0	0	0	0
	Total	> 16	> 16	> 10	4	1	0
Extreme southern limit	OCTOBER	52° 11'N 54° 09'W on 5.10.63					
	NOVEMBER	51° 22'N 54° 48'W on 6.11.63					
	DECEMBER*	—					
Extreme eastern limit	OCTOBER	52° 40'N 49° 00'W on 3.10.63					
	NOVEMBER	52° 48'N 52° 54'W on 10.11.63					
	DECEMBER*	—					

* No icebergs sighted during December.

> ("greater than") has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

Table 2. Baltic Ice Summary: October–December 1963

No ice was reported at the following stations during the period: Kiel, Flensburg, Tallin, W. Norrskar, Aarhus and Kristiansandfjord. No ice was reported at any of the stations during October.

[illegible]

CODE: A First day ice reported.
B Last day ice reported.
C No. of days that ice was

D No. of days continuous landfast ice.
E No. of days of pack-ice.
F No. of days dangerous to navigation,
G Accumulated degree-days of air temperature

but assistance not required.
temperature (°C) where known.*

* These figures give a rough measure of first the probability of the formation of sea ice, and later the progress of the growth and of its thickness. They are derived from daily averages of temperature ($00 + 06 + 12 + 18$ (GMT)) and are the sum of numbers of the degrees Celsius below zero experienced each day during the period of sustained frost.

Table 3. Canadian Ice Thickness and Snow Depth

END OF DECEMBER 1963

DISTRICT	CANADIAN ARCTIC					FOXE BASIN	BAFFIN BAY	DAVIS STRAIT	HUDSON BAY			
PLACE	DUMBELL BAY	ISACHEN	SACHS HARBOUR	CAMBRIDGE BAY	RESOLUTE	HALL BEACH	CLYDE RIVER	FROBISHER BAY	CORAL HARBOUR	FORT CHURCHILL	PORT HARRISON	MOOSENEE
ICE: THICKNESS IN INCHES	49	40	45	39	36	43	29	25	31	25	28	17
SNOW: DEPTH IN INCHES	4	6	4	5	6	2	5	6	10	3	2	4

Data supplied by courtesy of the Canadian Meteorological Office.

Ships continued to operate in and out of Archangel with assistance to the end of the month. The ice situation in the north of the area remained largely normal.

North Sea Ports. In the latter half of December fresh water ice obstructed rivers in the south-east of the North Sea, particularly the large commercial rivers of north-west Germany.

PRESENTATION OF BAROGRAPHS

As announced in the October 1963 number of *The Marine Observer*, inscribed barographs were awarded in 1963 by the Director General of the Meteorological Office to Captain E. C. Hicks (Pacific Steam Navigation Co. Ltd.), Captain W. Hine and Captain F. Lewis (both of Manchester Liners Ltd.) and Captain L. J. Skales (Port Line Ltd.).

The year was the sixteenth in which these special awards have been made but only once has it been possible to bring all four recipients together for the one ceremony. It was earlier hoped that this would have been possible in 1963 but, even as arrangements were being started, Captain Skales was called away to a 'Pier-head Jump' and will not therefore receive his award until he comes home again.

The presentations were made to Captains Hicks, Hine and Lewis at Bracknell on 10th December 1963. Listeners that day to the B.B.C. early morning programme 'To-day' had heard Captain Lewis being interviewed about this presentation and the years of voluntary service which he had done on our behalf. As customary on these occasions, a small luncheon party was staged and, in addition to the three Captains, we were pleased to welcome also Mrs. Hine and Mrs. Lewis. Captain Whitby, Assistant Marine Superintendent of Manchester Liners, was accompanied by Mrs. Whitby whilst the Pacific Steam Navigation Co. was represented by Captain Duguid, their Marine Superintendent and Mr. Macrae from their management.

In the absence from Bracknell of the Director General at a conference, the presentations were made by Dr. A. C. Best, Director of Services, who paid tribute to the help which the British Meteorological Office in particular had received from ships of Manchester Liners who had been observing for us ever since 1903 when we received a meteorological logbook from the *Manchester Shipper*. Though more remote, observations from ships of the Pacific Steam Navigation Company whose *Patagonia* we had recruited as long ago as 1869, had been valuable not only to this country but to world meteorology because they covered the West Coast of South America, one of the most sparsely covered oceanic areas of the world.

The luncheon was attended by the Marine Superintendent and senior officers of the branches of the Meteorological Office associated with ships' observations and afterwards the visitors were shown the workings of the office. A photograph taken at the presentation appears opposite page 84.

L. B. P.

Book Reviews

The Shoregoer's Guide to World Ports, compiled and edited by Ronald Hope, O.B.E., M.A., D.PHIL. 8 $\frac{3}{4}$ in. $\times$ 5 $\frac{3}{4}$ in. pp. 341. *Illus.* The Maritime Press, Ltd., London 1963. 21s.

"And there is no thrill
Like stepping ashore in a new country
With a clean shirt and with pound-notes in your pocket."

With these lines from a Seafarers' Education Service prize-winning poem by Charles Cousley, Dr. Hope introduces us to a book the need for which is probably more widely felt in these days of quick turn rounds than it has ever been. The reviewer when at sea was fortunate in being engaged on a more or less regular run and when he left port with sights unseen and excursions unmade, it was always with the comforting knowledge that next voyage he would be able to do all the things which he had left undone. On his infrequent visits to a strange port, the first evening was almost invariably spent in finding out what there was to do or see and there never seemed to be a second evening in which to put the knowledge to practical use.

To-day, visits to strange ports are no longer the prerogative of the tramp, for even the cargo liner companies frequently divert from their normal run, whilst tankers visit a variety of ports undreamed of years ago; destination ports are frequently changed on passage and the whole pattern of the shore side of a seafarer's life whilst on articles seems to be on an even more *ad hoc* basis than formerly.

Dr. Hope's book ensures that the seafarer may step ashore, be it for an hour or two, a day or even for an up-country excursion, already armed with knowledge of how to set about whatever he wants to do or see. As Sir Donald Anderson says in a foreword, "... with the help of this book, many an aimless wander ashore will become an interesting few hours of relaxation".

Basically, as the title implies, this is a guide book. One hundred and sixty-eight ports throughout the world are included in alphabetical order. Starting with a few words concerning the history of the port we are then given concise details of its places of interest, restaurants, shops, entertainments, sports facilities etc. and in most cases a small map also. But it goes far beyond the scope of the usual guide book for it gives such useful information as the number of the bus to catch; where to catch it; names of shops which may be relied on for good value; the legal taxi fares etc. and, very useful to the stranger in a strange land, some information on local customs and habits, ignorance of which must have marred many a run ashore in the past. For instance: "... it is not worth yielding to the blandishments of any taxi driver ... who promises other attractions, since there are none and the inside of the prison is said to be extremely unpleasant ...", "... all trade is done by haggling, halve the price asked and start from there ...", "... the taxi-meters are so out of date that the current charge is twelve times what is on the clock. ...", "... the western act of endearment of playing with the hair of the head will be resented ...".

We must commend Dr. Hope also for not allowing the shoregoer to forget that he often needs to keep his eye on the weather, just as if he were at sea. For instance, one would expect that sharks would spoil the pleasure of skin diving in Port Sudan, but we are told "sunburn is perhaps the *most dangerous* thing the diver must contend with", and again "... strangers are not advised to climb Table Mountain unless accompanied by someone familiar with it because cloud and mist form without warning and have caused many fatal accidents".

If the book has a fault it is that so few of the street plans are given a North-South arrow.

The ship's officer who wishes to make the best of the opportunities for seeing the world which his profession gives him, even in a somewhat restricted way, can

scarcely afford to be without this book. Certainly it should be in every ship's library. To the reviewer its perusal has been largely a voyage to nostalgia; the man at sea will be able to put it to a more practical use and it can be thoroughly recommended as an investment.

All royalties from its sale are being devoted to the funds of the Seafarers' Education Service.

L. B. P.

The Physical Geography of the Sea and its Meteorology, by Matthew Fontaine Maury. 9½ in. × 6½ in. pp. 446. *Illus.* Belknap Press of Harvard University Press, Cambridge, Mass., 1963. 68s.

An interesting book in an attractive modern cover was recently received by the Marine Division and proved in fact to be a reprint of a book published more than a century ago. The Belknap Press of Harvard University Press have had reprinted Maury's famous work *The Physical Geography of the Sea* which is based on his more famous *Sailing Directions*.

Maury's pioneering work which largely founded the organised study of marine climatology and oceanography of which the voluntary fleet of meteorological observing ships and the marine atlases of the Meteorological Office are typical 'offsprings' is part of the history of the sea. This reprint provides historians with a useful curio but I think it adds nothing to the author's almost legendary reputation. It certainly reveals his very great fund of knowledge and clear appreciation of the great scope of marine science, but it also reveals his lack of basic physics and mathematics and somewhat limited insight into the true nature of the phenomena in which he was so interested. For example, in Chapter 1 on page 23, the sea and atmosphere are discussed with a wealth of information but the subtle facts of atmospheric elasticity, the thermal structure of the sea and atmosphere, and geostrophic forces in spite of the considerable mathematical and physical knowledge of the time, are not discussed except indirectly by means of crude word pictures. (See for example paragraph 29.) In Chapter 2 the physics of the Gulf Stream are discussed without any great insight although the various theories put forward are of historical interest. Time has shown that the criticisms of Sir William Herschel have been proved by history to be unsound. I will not go any further into the scientific shortcomings of the book which is a hundred years old and which should not be criticised in the light of modern knowledge. However, it was the early maps of weather, including conditions over the sea, that Maury helped to pioneer that started the basic work on the dynamics of the atmosphere. Throughout the book one comes upon facts and discussions of very great interest and, for the time it was written, the book is a mine of information, although philosophically it is not very helpful. For example Chapter 14 on the basin and bed of the Atlantic contains discussions of early work in Marine biology and geology.

I found the Introduction the most interesting part of the book. This gives Maury's career at sea and details of his social background and friends and the somewhat strange history of the works he published.

This publication cannot be regarded as being of any great practical value to sailors or students of meteorology and oceanography but for the historian it could be of great value. It is interesting to note that the Meteorological Office Library are fortunate to have copies of Maury's original *Sailing Directions* and *The Physical Geography of the Sea*; both more than a century old and were part of the Library of the original Office. It is therefore the author's distinguished role in building the early foundations of marine observing that gives this reprint its great interest rather than the book's intrinsic merit.

G. A. T.

Personalities

OBITUARY.—We regret to record the death on 28th December 1963 at Sully Hospital, Glamorgan, of CAPTAIN AUBREY FORD, who was formerly in command of the British Ocean Weather Ship *Weather Reporter*.

Captain Ford, who was born in 1908, was appointed Master of *Weather Recorder* in 1947, when the ocean weather ships first came into service. In 1958, he took over the Command of *Weather Reporter*, the first of the 'Castle' class vessels to be converted to a weather ship. In October 1962, Captain Ford retired because of ill health. A notice about his career appeared in the January 1963 number of *The Marine Observer*. We recall that he did 111 voyages in command of weather ships. It was unfortunate that he should have died so soon after his retirement.

We offer our sympathy to his widow and his daughter.

C. E. N. F.

RETIREMENT.—COMMODORE L. A. HILL, D.S.C., R.D., R.N.R., retired from the sea in November 1963 after more than 39 years with the Peninsular and Orient Line.

Born in 1903 Leslie Alfred Hill was a cadet at Pangbourne Nautical College before serving his apprenticeship with the New Zealand Shipping Company. He joined the Peninsular and Orient Steam Navigation Company as fourth officer in the *Sardinia* in May 1924.

In August 1939, he was called up for active service in the R.N.R. and was awarded the D.S.C. in June 1940, for dangerous and successful experimental work in dealing with enemy mines. After the war Captain Hill returned to the P. and O. service as first officer in the *Ranchi*.

He was promoted to Captain, R.N.R. in December 1952, and subsequently served on a committee of enquiry into the future of the R.N.R.

In March 1953, he was appointed to his first command, the *Pinjarra*, and subsequently commanded many of the P. and O. cargo and passenger vessels, his last command being the *Canberra*. He was appointed Commodore of the P. and O.—Orient Line fleet on 24th January 1963.

His association with the Meteorological Office goes back to 1925 when he was serving in the *Khiva*, and in twelve observing years up to 1962 sent in 44 meteorological logbooks, 33 of which were classified as 'excellent'. He received Excellent Awards in 1938 and 1939. During his last year at sea when in command of the *Canberra* he observed for the Canadian Meteorological Branch.

We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN J. E. W. WILSON, O.B.E. retired from the Furness Warren Line on 31st December 1963 after nearly 50 years' service with the Company.

John Eric Walker Wilson made his first trip to sea at the outbreak of the 1914–18 War as an apprentice in the *Hambleton Range* owned by the Neptune Steam Navigation Company, which was later absorbed into Johnson Warren Lines.

After obtaining his second Mate's certificate, he sailed as 3rd Officer in the *Valemore* and other ships of the Company and passed for his Master's certificate in 1924. From 1926 to 1935 he served as 3rd, 2nd and Chief Officer of the *Nova Scotia*.

Shortly before the outbreak of the 1939–45 War, Captain Wilson joined the *Newfoundland* as Chief Officer, being promoted to Master in 1942. This ship had been refitted as a hospital ship in 1940 and after making a number of Atlantic crossings in this capacity, took part in the North Africa campaign and, later, the invasion of Italy. During this period she was bombed at Algiers, mined off Casablanca and finally sunk at Salerno in September 1943. For his courageous service and inspiring leadership, Captain Wilson was awarded the O.B.E. in January 1944.

After a period ashore on relieving duties, he was appointed Master of the *Monarch of Bermuda* and subsequently commanded *Empire Welland* and *Tusculum Victory*.

In 1947 Captain Wilson was appointed to the *Nova Scotia*, a new passenger liner being completed on the Tyne, and he remained in command of this ship for 15 years until she was sold in November 1962.

The last few months of Captain Wilson's service was spent in command of the *Beechmore* and after his last voyage in this ship in August 1963, the Directors of the Furness Warren Line held a reception on board the ship in Liverpool in his honour, at which every section of the Shipping Industry on Merseyside was represented.

During nearly 50 years at sea, Captain Wilson served over 40 years on the North Atlantic trade, making something like 700 crossings covering some 2,000,000 sailing miles.

Captain Wilson had an outstanding record with the Meteorological Office dating back to 1931. In 23 years observing he sent in 63 logbooks, 43 of which were classed 'excellent', and he received excellent awards on 9 occasions. In 1948 he was one of the first recipients of an inscribed barograph, the Special Long Service award of the Meteorological Office.

Except for a short period whilst in command of the *Monarch of Bermuda*, all Captain Wilson's voluntary observing was done in ships named *Newfoundland* or *Nova Scotia*, and in 1958 the *Nova Scotia* was included in the 'short list' of the 12 best logbooks of the year.

We wish him health and happiness in his retirement.

J. R. R.

RETIREMENT.—CAPTAIN E. C. PAINTER, D.S.C., retired from the sea after bringing the *Heron* into London on 16th January 1964, completing 36 years' service with the General Steam Navigation Company.

Ernest Charles Painter, when in command of m.v. *Goldfinch*, did good work evacuating troops from the beaches at St. Valéry en Eaux during the Dunkirk operation, for which he was awarded the D.S.C.

After the Second World War the Meteorological Office introduced the MARID Ship scheme. Captain Painter was one of the first to take on this work, and he has been a faithful observer of sea temperatures continuously for the last 18 years while in command of the *Crane*, *Grebe*, *Seamew*, *Ringdove*, and finally *Heron*.

We wish him health and happiness in his retirement.

J. C. M.

Notice to Marine Observers

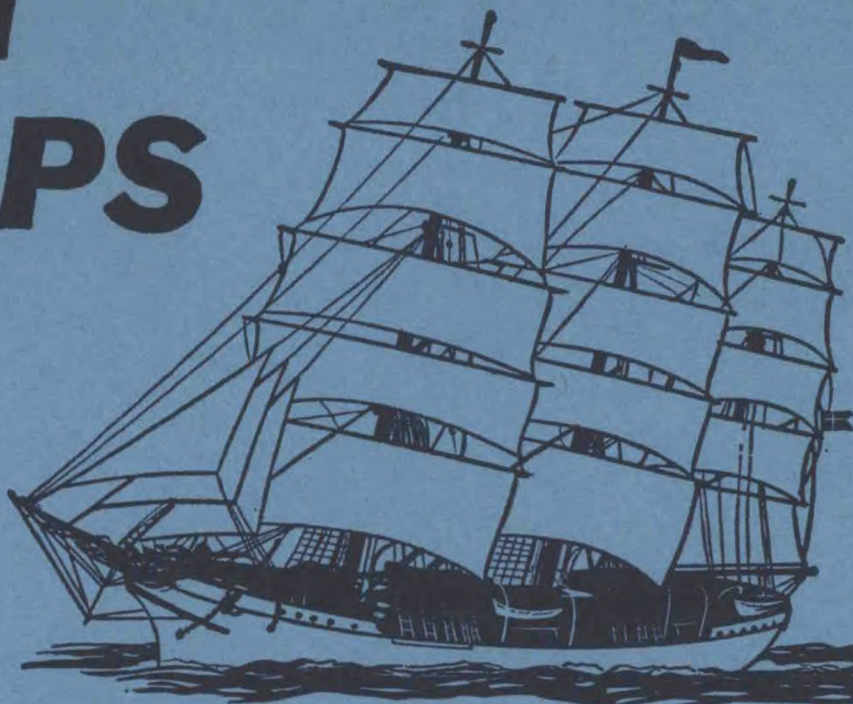
The address of Port Meteorological Officer, Glasgow, is now:

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Glasgow, C.2.

Telephone: Glasgow City 4372

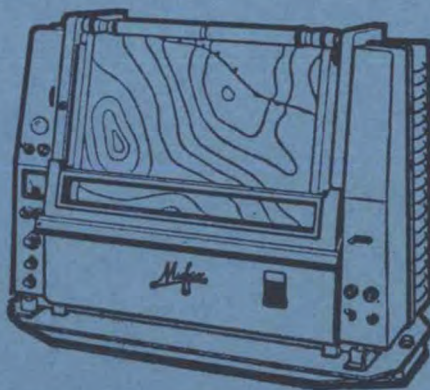
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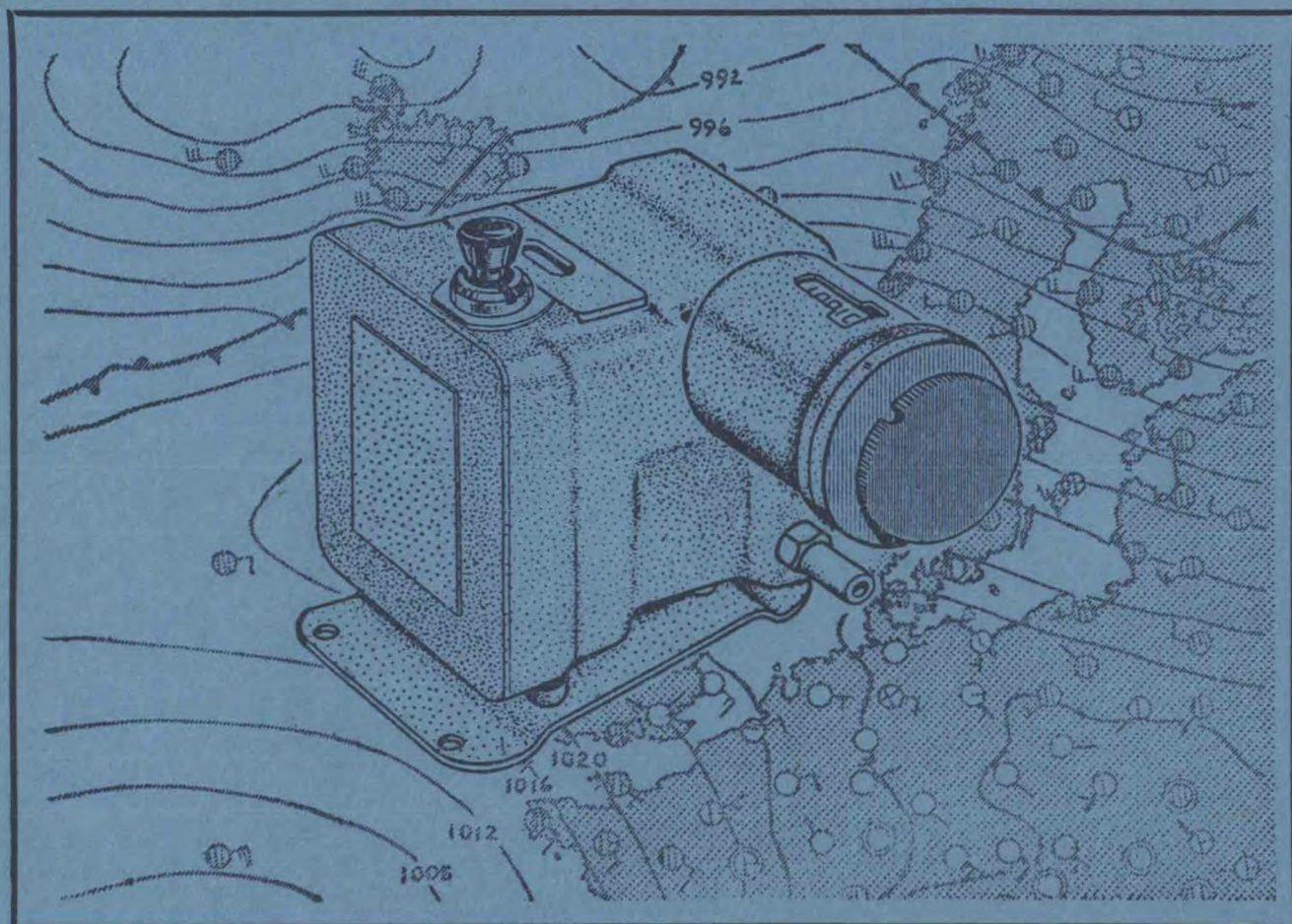
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